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# LED TV

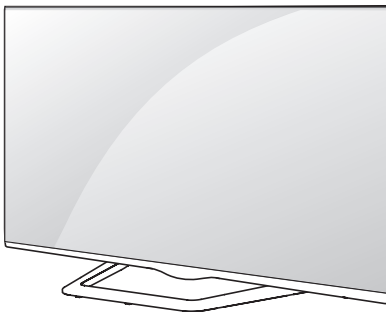
# SERVICE MANUAL

CHASSIS : LD34E

**MODEL: 84LA980V 84LA980V-ZD**

## CAUTION

BEFORE SERVICING THE CHASSIS,  
READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



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# SAFETY PRECAUTIONS

## IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by  $\triangle$  in the Schematic Diagram and Exploded View.

It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.

Do not modify the original design without permission of manufacturer.

### General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1 W), keep the resistor 10 mm away from PCB.

Keep wires away from high voltage or high temperature parts.

### Before returning the receiver to the customer,

always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

### Leakage Current Cold Check(Antenna Cold Check)

With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.

If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1 M $\Omega$  and 5.2 M $\Omega$ .

When the exposed metal has no return path to the chassis the reading must be infinite.

An other abnormality exists that must be corrected before the receiver is returned to the customer.

### Leakage Current Hot Check (See below Figure)

Plug the AC cord directly into the AC outlet.

### Do not use a line Isolation Transformer during this check.

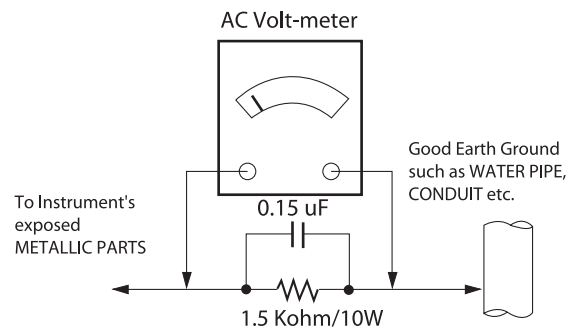
Connect 1.5 K / 10 watt resistor in parallel with a 0.15  $\mu$ F capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.

Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.

Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which corresponds to 0.5 mA.

In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

### Leakage Current Hot Check circuit



When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1  $\Omega$

\*Base on Adjustment standard

# SERVICING PRECAUTIONS

**CAUTION:** Before servicing receivers covered by this service manual and its supplements and addenda, read and follow the **SAFETY PRECAUTIONS** on page 3 of this publication.

**NOTE:** If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on page 3 of this publication, always follow the safety precautions. Remember: Safety First.

## General Servicing Precautions

1. Always unplug the receiver AC power cord from the AC power source before;

- Removing or reinstalling any component, circuit board module or any other receiver assembly.
- Disconnecting or reconnecting any receiver electrical plug or other electrical connection.
- Connecting a test substitute in parallel with an electrolytic capacitor in the receiver.

**CAUTION:** A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.

- Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc) equipped with a suitable high voltage probe. Do not test high voltage by "drawing an arc".
- Do not spray chemicals on or near this receiver or any of its assemblies.
- Unless specified otherwise in this service manual, clean electrical contacts only by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable non-abrasive applicator; 10 % (by volume) Acetone and 90 % (by volume) isopropyl alcohol (90 % - 99 % strength)
- CAUTION:** This is a flammable mixture. Unless specified otherwise in this service manual, lubrication of contacts is not required.
- Do not defeat any plug/socket B+ voltage interlocks with which receivers covered by this service manual might be equipped.
- Do not apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
- Always connect the test receiver ground lead to the receiver chassis ground before connecting the test receiver positive lead. Always remove the test receiver ground lead last.
- Use with this receiver only the test fixtures specified in this service manual.

**CAUTION:** Do not connect the test fixture ground strap to any heat sink in this receiver.

## Electrostatically Sensitive (ES) Devices

Some semiconductor (solid-state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static by static electricity.

- Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed to prevent potential shock reasons prior to applying power to the unit under test.

- After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
- Use only a grounded-tip soldering iron to solder or unsolder ES devices.
- Use only an anti-static type solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
- Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
- Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
- Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
- CAUTION:** Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
- Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

## General Soldering Guidelines

- Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range of 500 °F to 600 °F.
- Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
- Keep the soldering iron tip clean and well tinned.
- Thoroughly clean the surfaces to be soldered. Use a mall wire-bristle (0.5 inch, or 1.25 cm) brush with a metal handle. Do not use freon-propelled spray-on cleaners.
- Use the following unsoldering technique
  - Allow the soldering iron tip to reach normal temperature. (500 °F to 600 °F)
  - Heat the component lead until the solder melts.
  - Quickly draw the melted solder with an anti-static, suction-type solder removal device or with solder braid.**CAUTION:** Work quickly to avoid overheating the circuit board printed foil.
- Use the following soldering technique.
  - Allow the soldering iron tip to reach a normal temperature (500 °F to 600 °F)
  - First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
  - Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.**CAUTION:** Work quickly to avoid overheating the circuit board printed foil.
- Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.



### IC Remove/Replacement

Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

#### Removal

1. Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as the solder melts.
2. Draw away the melted solder with an anti-static suction-type solder removal device (or with solder braid) before removing the IC.

#### Replacement

1. Carefully insert the replacement IC in the circuit board.
2. Carefully bend each IC lead against the circuit foil pad and solder it.
3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas).

### "Small-Signal" Discrete Transistor

#### Removal/Replacement

1. Remove the defective transistor by clipping its leads as close as possible to the component body.
2. Bend into a "U" shape the end of each of three leads remaining on the circuit board.
3. Bend into a "U" shape the replacement transistor leads.
4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact then solder each connection.

### Power Output, Transistor Device

#### Removal/Replacement

1. Heat and remove all solder from around the transistor leads.
2. Remove the heat sink mounting screw (if so equipped).
3. Carefully remove the transistor from the heat sink of the circuit board.
4. Insert new transistor in the circuit board.
5. Solder each transistor lead, and clip off excess lead.
6. Replace heat sink.

### Diode Removal/Replacement

1. Remove defective diode by clipping its leads as close as possible to diode body.
2. Bend the two remaining leads perpendicular y to the circuit board.
3. Observing diode polarity, wrap each lead of the new diode around the corresponding lead on the circuit board.
4. Securely crimp each connection and solder it.
5. Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and if necessary, apply additional solder.

### Fuse and Conventional Resistor

#### Removal/Replacement

1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.

3. Solder the connections.

**CAUTION:** Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

### Circuit Board Foil Repair

Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board causing the foil to separate from or "lift-off" the board. The following guidelines and procedures should be followed whenever this condition is encountered.

#### At IC Connections

To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections).

1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
2. Carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

#### At Other Connections

Use the following technique to repair the defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.

1. Remove the defective copper pattern with a sharp knife. Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.
2. Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
3. Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side. Carefully crimp and solder the connections.

**CAUTION:** Be sure the insulated jumper wire is dressed so the it does not touch components or sharp edges.

# SPECIFICATION

NOTE : Specifications and others are subject to change without notice for improvement.

## 1. Application range

This specification is applied to the LED TV used LD34E chassis.

## 2. Requirement for Test

Each part is tested as below without special appointment.

- 1) Temperature: 25 °C ± 5 °C(77 °F ± 9 °F), CST: 40 °C ± 5 °C
- 2) Relative Humidity: 65 % ± 10 %
- 3) Power Voltage
  - : Standard input voltage (AC 100-240 V~, 50/60 Hz)
  - \* Standard Voltage of each products is marked by models.
- 4) Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.
- 5) The receiver must be operated for about 20 minutes prior to the adjustment.

## 3. Test method

- 1) Performance: LGE TV test method followed
- 2) Demanded other specification
  - Safety : CE, IEC specification
  - EMC : CE, IEC
  - Wireless : Wireless HD Specification (Option)

## 4. Model General Specification

No.	Item	Specification	Remarks
1	Market	EU(PAL Market-36Countries)/CIS + Morocco(Africa)	<p><b>DTV &amp; Analog (Total 37 countries)</b></p> <p><b>DTV (MPEG2/4, DVB-T) : 30 countries</b> Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus</p> <p><b>DTV (MPEG2/4, DVB-T2) : 8 countries</b> UK(Ireland), Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan, Russia</p> <p><b>DTV (MPEG2/4, DVB-C) : 37 countries</b> Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus, UK, Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan</p> <p><b>DTV (MPEG2/4, DVB-S/S2) : 30 countries</b> Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus, UK, Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan</p> <p><b>Supported satellite : 29 satellites</b> ABS1 75.0E/ AMOS 4.0W/ ASIATSATS 105.5E/ ASTRA1LHMKR 19.2E/ ASTRA2ABD 28.2E/ ASTRA3AB 23.5E/ ASTRA4A 4.8E/ ATLANTICBIRD2 8.0W/ ATLANTICBIRD3 5.0W/ BADR 26.0E/ EURO-BIRD3 33.0E/ EURO-BIRD9A 9.0E/ EUTELSATW2A 10.E/ EUTELSATW3A 7.0E/ EUTELSATW4W7 36.0E/ EUTELSESAT 16.0E/ EXPRESSAM1 40.0E/ EXPRESAM3 140.0E/ EXPRESSAM33 96.5E/ HELLASAT2 39.0E/ HISPASAT1CDE 30.0W/ HOTBIRD 13.0E/ INTELSAT10&amp;7 68.5E/ INTELSAT15 85.2E/ INTELSAT904 60.0E/ NILESAT 7.0W/ THOR 0.8W/ TURKSAT 42.0E/ YAMAL201 90.0E</p>

No.	Item	Specification	Remarks
2	Broadcasting system	1) PAL-BG/DK/I/I' 2) SECAM L/L', DK, BG, I 3) DVB-T/T2, C, S/S2	
3	Program coverage	1 ) Digital TV - VHF, UHF - C-Band, Ku-Band 2) Analogue TV -VHF : E2 to E12 -UHF : E21 to E69 -CATV : S1 to S20 -HYPER : S21 to S47	
4	Receiving system	Analog : Upper Heterodyne Digital : COFDM, QAM	<p>► DVB-T</p> <ul style="list-style-type: none"> <li>- Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32</li> <li>- Modulation : Code Rate QPSK : 1/2, 2/3, 3/4, 5/6, 7/8 16-QAM : 1/2, 2/3, 3/4, 5/6, 7/8 64-QAM : 1/2, 2/3, 3/4, 5/6, 7/8</li> </ul> <p>► DVB-T2</p> <ul style="list-style-type: none"> <li>- Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32, 1/128, 19/128, 19/256,</li> <li>- Modulation : Code Rate QPSK : 1/2, 2/5, 2/3, 3/4, 5/6 16-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 64-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 256-QAM : 1/2, 2/5, 2/3, 3/4, 5/6</li> </ul> <p>► DVB-C</p> <ul style="list-style-type: none"> <li>- Symbolrate : 4.0Msymbols/s to 7.2 Msymbols/s</li> <li>- Modulation : 16QAM, 64-QAM, 128-QAM and 256-QAM</li> </ul> <p>► DVB-S/S2</p> <ul style="list-style-type: none"> <li>- symbolrate : DVB-S2 (8PSK / QPSK) : 2 ~ 45 Msymbol/s DVB-S (QPSK) : 2 ~ 45 Msymbol/s</li> <li>- viterbi DVB-S mode : 1/2, 2/3, 3/4, 5/6, 7/8 DVB-S2 mode : 1/2, 2/3, 3/4, 3/5, 4/5, 5/6, 8/9, 9/10</li> </ul>
5	Input Voltage	AC 100 ~ 240 V, 50/60 Hz	

## 5. External input format

### 5.1. 2D Mode

(1) Component input(Y, Cb/Pb, Cr/Pr)

No.	Resolution	H-freq(kHz)	V-freq(Hz)	
1.	720×480	15.73	60.00	SDTV, DVD 480i
2.	720×480	15.63	59.94	SDTV, DVD 480i
3.	720×480	31.47	59.94	480p
4.	720×480	31.50	60.00	480p
5.	720×576	15.625	50.00	SDTV 576i
6.	720×576	31.25	50.00	SDTV 576p
7.	1280×720	45.00	50.00	HDTV 720p
8.	1280×720	44.96	59.94	HDTV 720p
9.	1280×720	45.00	60.00	HDTV 720p
10.	1920×1080	31.25	50.00	HDTV 1080i
11.	1920×1080	33.75	60.00	HDTV 1080i
12.	1920×1080	33.72	59.94	HDTV 1080i
13.	1920×1080	56.250	50	HDTV 1080p
14.	1920×1080	67.5	60	HDTV 1080p

(2) HDMI Input (PC/DTV)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	Proposed	
<b>HDMI-PC</b>						DDC
1	640*350	31.468	70.09	25.17	EGA	X
2	720*400	31.469	70.08	28.32	DOS	O
3	640*480	31.469	59.94	25.17	VESA(VGA)	O
4	800*600	37.879	60.31	40.00	VESA(SVGA)	O
5	1024*768	48.363	60.00	65.00	VESA(XGA)	O
6	1152*864	54.348	60.053	80	VESA	O
7	1280*1024	63.981	60.020	108	VESA(SXGA)	O
8	1360*768	47.712	60.015	85.5	VESA(WXGA)	O
9	1920*1080	67.5	60.00	148.5	WUXGA(Reduced Blanking)	O
10	3840*2160	67.5	30.00	297.00	UD	
11	3840*2160	56.25	25.00	297.00	UD	
12	3840*2160	54.0	24.00	297.00	UD	
<b>HDMI-DTV</b>						
1	720*480	31.47	60	27.027	SDTV 480P	
2	720*480	31.47	59.94	27.00	SDTV 480P	
3	1280*720	45.00	60.00	74.25	HDTV 720P	
4	1280*720	44.96	59.94	74.176	HDTV 720P	
5	1920*1080	33.75	60.00	74.25	HDTV 1080I	
6	1920*1080	33.72	59.94	74.176	HDTV 1080I	
7	1920*1080	67.500	60	148.50	HDTV 1080P	
8	1920*1080	67.432	59.939	148.352	HDTV 1080P	
9	1920*1080	27.000	24.000	74.25	HDTV 1080P	
10	1920*1080	26.97	23.976	74.176	HDTV 1080P	
11	1920*1080	33.75	30.000	74.25	HDTV 1080P	
12	1920*1080	33.71	29.97	74.176	HDTV 1080P	
13	3840*2160	67.5	30.00	297.00	UDTV 2160P	
14	3840*2160	56.25	25.00	297.00	UDTV 2160P	
15	3840*2160	54.0	24.00	297.00	UDTV 2160P	

## 5.2. 3D Mode

(1) RF Input(3D supported mode manually)

No.	Resolution	Proposed	3D input proposed mode
1	HD - DTV	1080I 720P	2D to 3D Side by Side(Half) Top & Bottom
2	SD - DTV	576P 576I	
3	SD - ATV(CVBS/SCART)		

(2) RF Input(3D supported mode automatically)

No.	Signal	3D input proposed mode
1	Frame Compatible	Side by Side(Half), Top & Bottom

(3) HDMI 1.3 (3D supported mode manually)

No	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	Proposed	3D input proposed mode
1	720*480	31.5	60	27.03	SDTV 480P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Frame Sequential, Row Interleaving, Column Interleaving
2	720*576	31.25	50	27	SDTV 576P	
3	1280*720	45.00	60.00	74.25	HDTV 720P	
4	1280*720	37.500	50	74.25	HDTV 720P	
5	1920*1080	33.75	60.00	74.25	HDTV 1080I	2D to 3D, Side by Side(Half), Top & Bottom
6	1920*1080	28.125	50.00	74.25	HDTV 1080I	
7	1920*1080	27.00	24.00	74.25	HDTV 1080P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Row Interleaving, Column Interleaving
8	1920*1080	28.12	25	74.25	HDTV 1080P	
9	1920*1080	33.75	30.00	74.25	HDTV 1080P	
10	1920*1080	67.50	60.00	148.5	HDTV 1080P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Single Frame Sequential, Row Interleaving, Column Interleaving
11	1920*1080	56.250	50	148.5	HDTV 1080P	
12	3840*2160	53.95	23.976	297.00	HDTV 2160P	2D to 3D, Top & Bottom(half), Side by Side(half)
		54	24.00	296.703		
		56.25	25.00	297.00		
		61.43	29.970	297.00		
		67.5	30.00	296.703		

## (4) HDMI 1.4b (3D supported mode automatically)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	VIC	3D input proposed mode	Proposed
1	640*480	31.469 / 31.5	59.94/ 60	25.125/25.2	1	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 480P) Secondary(SDTV 480P)
2		62.938/63	59.94/ 60	50.35/50.4	1	Frame packing Line alternative	Secondary(SDTV 480P) (SDTV 480P)
3		31.469 / 31.5	59.94/ 60	50.35/50.4	1	Side-by-side(Full)	(SDTV 480P)
4	720*480	31.469 / 31.5	59.94 / 60	27.00/27.03	2,3	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 480P) Secondary(SDTV 480P)
5		62.938/63	59.94 / 60	54/54.06	2,3	Frame packing Line alternative	Secondary(SDTV 480P) (SDTV 480P)
6		31.469 / 31.5	59.94 / 60	54/54.06	2,3	Side-by-side(Full)	(SDTV 480P)
7	720*576	31.25	50	27	17,18	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 576P) Secondary(SDTV 576P)
8		62.5	50	54	17,18	Frame packing Line alternative	Secondary(SDTV 576P) (SDTV 576P)
9		31.25	50	54	17,18	Side-by-side(Full)	(SDTV 576P)
10	1280*720	37.500	50	74.25	19	Top-and-Bottom Side-by-side(half)	Primary(HDTV 720P) Primary(HDTV 720P)
11		75	50	148.5	19	Frame packing Field alternative	Primary(HDTV 720P) (HDTV 720P)
12		37.500	50	148.5	19	Side-by-side(Full)	(HDTV 720P)
13		44.96 / 45	59.94 / 60	74.18/74.25	4	Top-and-Bottom Side-by-side(half)	Primary(HDTV 720P) Primary(HDTV 720P)
14		89.91/90	59.94 / 60	148.35/148.5	4	Frame packing Line alternative	Primary(HDTV 720P) (HDTV 720P)
15		44.96 / 45	59.94 / 60	148.35/148.5	4	Side-by-side(Full)	(HDTV 720P)
16	1920*1080	33.72 / 33.75	59.94 / 60	74.18/74.25	5	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080I) Primary(HDTV 1080I)
17		67.432/67.50	59.94 / 60	148.35/148.5	5	Frame packing Line alternative	Primary(HDTV 1080I) (HDTV 1080I)
18		33.72 / 33.75	59.94 / 60	148.35/148.5	5	Side-by-side(Full)	(HDTV 1080I)
19		28.125	50.00	74.25	20	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080I) Primary(HDTV 1080I)
20		56.25	50.00	148.5	20	Frame packing Field alternative	Primary(HDTV 1080I) (HDTV 1080I)
21		28.125	50.00	148.5	20	Side-by-side(Full)	(HDTV 1080I)
22		26.97 / 27	23.97 / 24	74.18/74.25	32	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Primary(HDTV 1080P)
23		43.94/54	23.97 / 24	148.35/148.5	32	Frame packing Field alternative	Primary(HDTV 1080P) (HDTV 1080P)
24		26.97 / 27	23.97 / 24	148.35/148.5	32	Side-by-side(Full)	(HDTV 1080P)
25		28.12	25	74.25	33	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Primary(HDTV 1080P)
26		56.24	25	148.5	33	Frame packing Line alternative	Primary(HDTV 1080P) (HDTV 1080P)
27		28.12	25	148.5	33	Side-by-side(Full)	(HDTV 1080P)
28		33.716 / 33.75	29.976 / 30.00	74.18/74.25	34	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080P) Secondary(HDTV 1080P)
29		67.432 / 67.5	29.976 / 30.00	148.35/148.5	34	Frame packing Line alternative	Secondary(HDTV 1080P) (HDTV 1080P)
30		33.716 / 33.75	29.976 / 30.00	148.35/148.5	34	Side-by-side(Full)	(HDTV 1080P)
31		56.250	50	148.5	31	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Secondary(HDTV 1080P)
32		67.43 / 67.5	59.94 / 60	148.35/148.50	16	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Secondary(HDTV 1080P)

## (5) HDMI-PC Input (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode	Proposed
1	1024*768	48.36	60	65	2D to 3D, Side by Side(half) Top & Bottom	HDTV 768P
2	1360*768	47.71	60	85.5	2D to 3D, Side by Side(half) Top & Bottom	HDTV 768P
3	1920*1080	67.500	60	148.50	2D to 3D, Side by Side(half) Top & Bottom, Checker Board, Single Frame Sequential, Row Interleaving, Column Interleaving	HDTV 1080P
4	3840*2160	54 56.25 67.5	24 25 30	296.703 297 296.703	HDTV 2160P	2D to 3D, Top & Bottom(half), Side by Side(half),
5	3840*2160	-	-	297	2D to 3D	640*350 720*400 640*480 800*600 1152*864

## (6) Component Input ( 3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock	3D input proposed mode	Proposed
1	1280*720	37.5	50	74.25	2D to 3D, Side by Side(half), Top & Bottom	HDTV 720P
2	1280*720	45.00	60.00	74.25	2D to 3D, Side by Side(half), Top & Bottom	HDTV 720P
3	1280*720	44.96	59.94	74.176	2D to 3D, Side by Side(half), Top & Bottom	HDTV 720P
4	1920*1080	33.75	60.00	74.25	2D to 3D, Side by Side(half), Top & Bottom	HDTV 1080I
5	1920*1080	33.72	59.94	74.176	2D to 3D, Side by Side(half), Top & Bottom	HDTV 1080I
6	1920*1080	28.12	50	74.25	2D to 3D, Side by Side(half), Top & Bottom	HDTV 1080I
7	1920*1080	67.500	60	148.50	2D to 3D, Side by Side(half), Top & Bottom	HDTV 1080P
8	1920*1080	67.432	59.94	148.352	2D to 3D, Side by Side(half), Top & Bottom	HDTV 1080P
9	1920*1080	27.000	24.000	74.25	2D to 3D, Side by Side(half), Top & Bottom	HDTV 1080P
10	1920*1080	28.12	25	74.25	2D to 3D, Side by Side(half), Top & Bottom	HDTV 1080P
11	1920*1080	56.25	50	74.25	2D to 3D, Side by Side(half), Top & Bottom	HDTV 1080P
12	1920*1080	26.97	23.976	74.176	2D to 3D, Side by Side(half), Top & Bottom	HDTV 1080P
13	1920*1080	33.75	30.000	74.25	2D to 3D, Side by Side(half), Top & Bottom	HDTV 1080P
14	1920*1080	33.71	29.97	74.176	2D to 3D, Side by Side(half), Top & Bottom	HDTV 1080P

## (7) USB, DLNA - Movie (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	Under 704x480	-	-	-	2D to 3D
2	Over 704x480 interlaced	-	-	-	2D to 3D, Side by Side(Half), Top & Bottom
3	Over 704x480 progressive	-	50 / 60	-	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Row Interleaving, Column Interleaving, Frame Sequential
4		-	others	-	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Row Interleaving, Column Interleaving

(8) USB, DLNA -Photo (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	Under 320x240	-	-	-	2D to 3D
2	Over 320x240	-	-	-	2D to 3D, Side by Side(Half), Top & Bottom









(9) USB, DLNA (3D) (3D supported mode automatically)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	1080p	33.75	30	74.25	Side by Side(Half), Top & Bottom, Checker Board, MPO(Photo), JPS(Photo)

(10) Miracast, Widi (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	1024x768p	-	30 / 60	-	2D to 3D, Side by Side(Half), Top & Bottom
2.	1280x720p	-	30 / 60	-	
3	1920x1080p		30 / 60		
4	Others		-		2D to 3D

■ Remark: 3D Input mode

No.	Side by Side	Top & Bottom	Checker board	Single Frame Sequential	Frame Packing	Line Interleaving	Column Interleaving	2D to 3D
1								



## ADJUSTMENT INSTRUCTION

## 1. Application Range

This specification sheet is applied to all of the LED TV with LD34E chassis.

## 2. Designation

- (1) Because this is not a hot chassis, it is not necessary to use an isolation transformer. However, the use of isolation transformer will help protect test instrument.
- (2) Adjustment must be done in the correct order.
- (3) The adjustment must be performed in the circumstance of  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  of temperature and  $65\% \pm 10\%$  of relative humidity if there is no specific designation.
- (4) The input voltage of the receiver must keep AC 100-240 V~, 50/60 Hz.
- (5) The receiver must be operated for about 5 minutes prior to the adjustment when module is in the circumstance of over 15.

In case of keeping module is in the circumstance of 0 °C, it should be placed in the circumstance of above 15 °C for 2 hours.

In case of keeping module is in the circumstance of below  $-20^{\circ}\text{C}$ , it should be placed in the circumstance of above  $15^{\circ}\text{C}$  for 3 hours.

[Caution]

When still image is displayed for a period of 20 minutes or longer (Especially where W/B scale is strong. Digital pattern 13ch and/or Cross hatch pattern 09ch), there can some afterimage in the black level area.

### 3. Automatic Adjustment

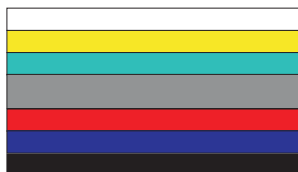
### 3.1. ADC Adjustment

### 3.1.1. Overview

ADC adjustment is needed to find the optimum black level and gain in Analog-to-Digital device and to compensate RGB deviation.

### 3.1.2. Equipment & Condition

- (1) USB to RS-232C Jig
- (2) MSPG-925 Series Pattern Generator (MSPG-925FA, pattern - 65)
  - Resolution : 480i Comp1  
1080P Comp1  
1920\*1080P SCART RGB
  - Pattern : Horizontal 100% Color Bar Pattern
  - Pattern level :  $0.7 \pm 0.1$  Vp-p
  - Image



### 3.1.3. Adjustment

- (1) Adjustment method  
- Using RS-232, adjust items in the other shown in "3.1.3.3")

- (2) Adj. protocol

Protocol	Command	Set ACK
Enter adj. mode	aa 00 00	a 00 OK00x
Source change	xb 00 04 xb 00 06	b 00 OK04x (Adjust 480i, 1080p Comp1 ) b 00 OK06x (Adjust 1920*1080 SCART RGB)
Begin adj.	ad 00 10	
Return adj. result		OKx (Case of Success) NGx (Case of Fail)
Read adj. data	(main) ad 00 20 (sub ) ad 00 21	(main) 000000000000000000000000000000007c007b006dx (Sub) 000000070000000000000000000000007c00830077x
Confirm adj.	ad 00 99	NG 03 00x (Fail) NG 03 01x (Fail) NG 03 02x (Fail) OK 03 03x (Success)
End adj.	aa 00 90	a 00 OK90x

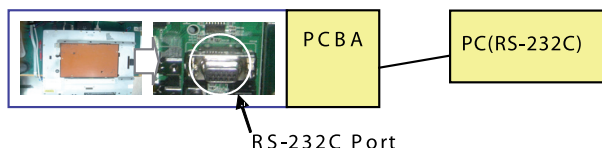
Ref.) ADC Adj. RS232C Protocol Ver1.0

- (3) Adj. order

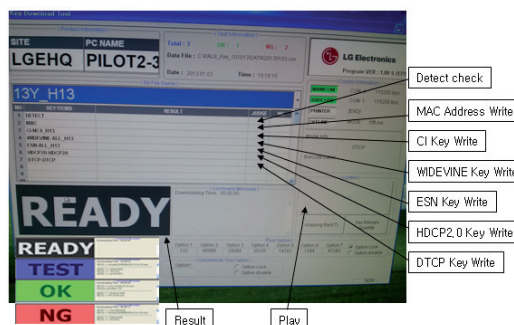
- aa 00 00 [Enter ADC adj. mode]
- xb 00 04 [Change input source to Component1 (480i&1080p)]
- ad 00 10 [Adjust 480i&1080p Comp1]
- xb 00 06 [Change input source to RGB(1024\*768)]
- ad 00 10 [Adjust 1920\*1080 SCART RGB]
- ad 00 90 End adj.

### 3.2. MAC address D/L, CI+ key D/L, Widevine key D/L, ESN key D/L, HDCP key D/L, DTCP key D/L

Connect: PCBA Jig → RS-232C Port== PC → RS-232C Port  
Communication Prot connection



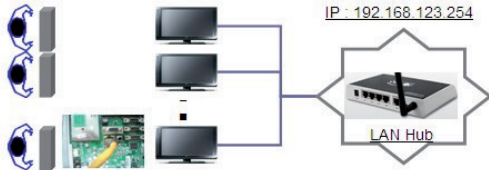
- Com 1,2,3,4 and 115200(Baudrate)  
Mode check: Online Only
- Check the test process: DETECT → MAC → CI → Widevine  
→ ESN → HDCP → DTCP
- Play: START
- Result: Ready, Test, OK or NG
- Printer Out (MAC Address Label)



### 3.3. LAN Inspection

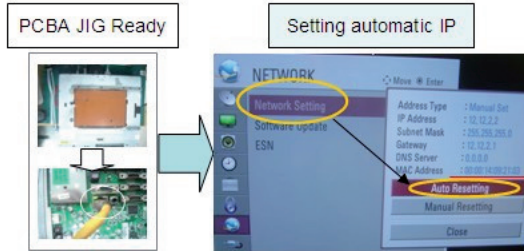
#### 3.3.1. Equipment & Condition

- Each other connection to LAN Port of IP Hub and Jig



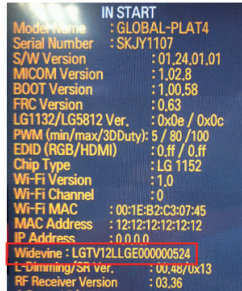
#### 3.3.2. LAN inspection solution

- LAN Port connection with PCB
- Network setting at MENU Mode of TV
- Setting automatic IP
- Setting state confirmation
  - If automatic setting is finished, you confirm IP and MAC Address.



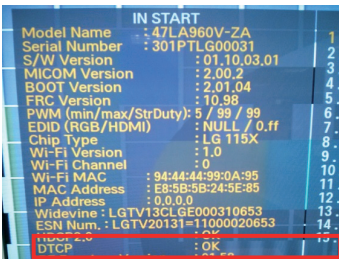
#### 3.3.3. WIDEVINE key Inspection

- Confirm key input data at the "IN START" MENU Mode.



#### 3.3.4. DTCP Inspection

- Confirm Key input at the "IN START" MENU Mode
- Below DTCP check on "IN START" MENU is enabled only for Models which "DTCP key" tool option is "ON"
- Only EU suffix models DTCP key option is on. (ex. 47LA790V-ZA.KEUYLJG)



### 3.4. LAN PORT INSPECTION(PING TEST)

Connect SET → LAN port == PC → LAN Port

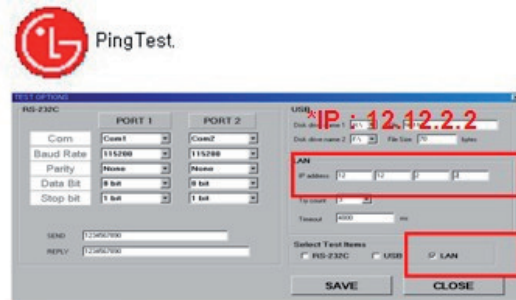


#### 3.4.1. Equipment setting

- Play the LAN Port Test PROGRAM.
- Input IP set up for an inspection to Test Program.  
\*IP Number : 12.12.2.2

#### 3.4.2. LAN PORT inspection(PING TEST)

- Play the LAN Port Test Program.
- Connect each other LAN Port Jack.
- Play Test (F9) button and confirm OK Message.
- Remove LAN cable.



### 3.5. Model name & Serial number Download

#### 3.5.1. Model name & Serial number D/L

- Press "Power on" key of service remote control.  
(Baud rate : 115200 bps)
- Connect RS-232C Signal to USB Cable to USB.
- Write Serial number by use USB port.
- Must check the serial number at Instart menu.

#### 3.5.2. Method & notice

- Serial number D/L is using of scan equipment.
- Setting of scan equipment operated by Manufacturing Technology Group.
- Serial number D/L must be conformed when it is produced in production line, because serial number D/L is mandatory by D-book 4.0.

\* Manual Download (Model Name and Serial Number)  
If the TV set is downloaded by OTA or service man, sometimes model name or serial number is initialized.(Not always)  
It is impossible to download by bar code scan, so It need Manual download.

- Press the "Instart" key of Adjustment remote control.
- Go to the menu "7.Model Number D/L" like below photo.
- Input the Factory model name(ex 47LM960V-ZB) or Serial number like photo.



- Check the model name Instart menu. → Factory name displayed. (ex 47LM960V-ZB)
- Check the Diagnostics.(DTV country only) → Buyer model displayed. (ex 47LM960V-ZB)

### 3.6. CI+ Key checking method

\* Check the Section 3.2

Check whether the key was downloaded or not at 'In Start' menu. (Refer to below).



=> Check the Download to CI+ Key value in LGset.

#### 3.6.1. Check the method of CI+ Key value

- Check the method on Instart menu
- Check the method of RS232C Command
  - Into the main ass'y mode(RS232: aa 00 00)

CMD 1	CMD 2	Data 0
A	A	0 0

- Check the key download for transmitted command (RS232: ci 00 10)

CMD 1	CMD 2	Data 0
C	I	1 0

- Result value

- Normally status for download : OKx
- Abnormally status for download : NGx

#### 3.6.2. Check the method of CI+ key value(RS232)

- Into the main ass'y mode(RS232: aa 00 00)

CMD 1	CMD 2	Data 0
A	A	0 0

- Check the mothod of CI+ key by command (RS232: ci 00 20)

CMD 1	CMD 2	Data 0
C	I	2 0

- Result value

i 01 OK 1d1852d21c1ed5dcx

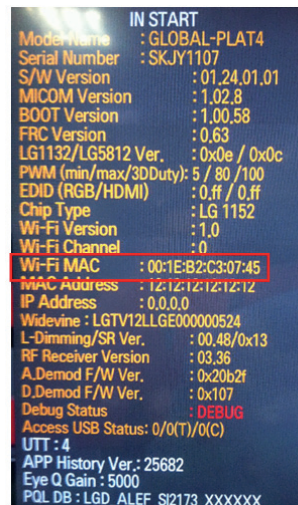
→ CI+ Key Value

### 3.7. WIFI MAC ADDRESS CHECK

- Using RS232 Command

	H-freq(kHz)	V-freq.(Hz)
Transmission	[A][I][Set ID][20][Cr]	[O][K][X] or [NG]

- Check the menu on in-start



## 4. Manual Adjustment

\* ADC adjustment is not needed because of OTP(Auto ADC adjustment)

### 4.1. EDID(The Extended Display Identification Data)/DDC(Display Data Channel) download

#### 4.1.1. Overview

It is a VESA regulation. A PC or a MNT will display an optimal resolution through information sharing without any necessity of user input. It is a realization of "Plug and Play".

#### 4.1.2. Equipment

- Since embedded EDID data is used, EDID download JIG, HDMI cable and D-sub cable are not need.
- Adjustment remote control

#### 4.1.3. Download method

- (1) Press "ADJ" key on the Adjustment remote control then select "12.EDID D/L", By pressing "Enter" key, enter EDID D/L menu.
- (2) Select "Start" button by pressing "Enter" key, HDMI1/ HDMI2/ HDMI3 are writing and display OK or NG.



#### 4.1.4. EDID DATA

##### • HDMI

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	(a)		(b)			
0x10	(c)		01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
0x20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
0x30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
0x40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
0x50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
0x60	3E	1E	53	10	00	0A	20	20	20	20	20	20	(d)			
0x70	(d)														01	ⓔ1
0x80	02	03	3A	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
0x90	22	15	01	29	3D	06	C0	15	07	50	09	57	07	(f)		
0xA0	(f)															
0xB0	(f)						E3	05	03	01	02	3A	80	18	71	38
0xC0	2D	40	58	2C	45	00	40	84	63	00	00	1E	01	1D	80	18
0xD0	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D
0xE0	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E
0xF0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	ⓔ1

##### • Detail EDID Options are below

- HDMI1 ~ HDMI3
- In the data of EDID, bellows may be different by S/W or Input mode.

##### (a) Product ID

MODEL NAME	HEX	EDID Table	DDC Function
HD/FHD Model	0001	01 00	Analog/Digital

##### (b) Serial No: Controlled on production line.

##### (c) Month, Year: Controlled on production line:

ex) Monthly : '01' → '01', Year : '2013' → '17'

##### (d) Model Name(Hex): LGTV

Cf) TV set's model name in EDID data is below.

MODEL NAME(HEX)																
LG TV	00	00	00	FC	00	4C	47	20	54	56	0A	20	20	20	20	20

##### (e) Checksum(LG TV): Changeable by total EDID data.

EDID C/S data		FHD
		HDMI
check sum (Hex)	Block 0	42
	Block 1	23 (HDMI1)
		13 (HDMI2)

##### (f) Vendor Specific(HDMI)

INPUT	MODEL NAME(HEX)
HDMI1	78030C001000801E
HDMI2	78030C002000801E

##### (1) EDID

##### # HDMI 1(C/S : E8 E0)

##### EDID Block 0, Bytes 0-127 [00H-7FH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	20	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E8

##### EDID Block 1, Bytes 128-255 [80H-FFH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80	02	03	3E	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
90	22	15	01	29	3D	06	C0	15	07	50	09	57	07	7C	03	0C
A0	00	10	00	B8	3C	20	C0	8E	01	02	03	04	01	4F	3F	FC
B0	08	10	18	10	06	10	16	10	28	10	E3	05	03	01	02	3A
C0	80	18	71	38	2D	40	58	2C	45	00	40	84	63	00	00	1E
D0	01	1D	80	18	71	1C	16	20	58	2C	25	00	40	84	63	00
E0	00	9E	01	1D	00	72	51	D0	1E	20	6E	28	55	00	40	84
F0	63	00	00	1E	00	00	00	00	00	00	00	00	00	00	00	E0

##### # HDMI 2(C/S : E8 D0)

##### EDID Block 0, Bytes 0-127 [00H-7FH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	20	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E8

##### EDID Block 1, Bytes 128-255 [80H-FFH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80	02	03	3E	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
90	22	15	01	29	3D	06	C0	15	07	50	09	57	07	7C	03	0C
A0	00	10	00	B8	3C	20	C0	8E	01	02	03	04	01	4F	3F	FC
B0	08	10	18	10	06	10	16	10	28	10	E3	05	03	01	02	3A
C0	80	18	71	38	2D	40	58	2C	45	00	40	84	63	00	00	1E
D0	01	1D	80	18	71	1C	16	20	58	2C	25	00	40	84	63	00
E0	00	9E	01	1D	00	72	51	D0	1E	20	6E	28	55	00	40	84
F0	63	00	00	1E	00	00	00	00	00	00	00	00	00	00	00	D0



## # HDMI 3(C/S : E8 C0)

### EDID Block 0, Bytes 0-127 [00H-7FH]

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	01	E8

### EDID Block 1, Bytes 128-255 [80H-FFH]

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80	02	03	3E	F1	4E	10	9F	04	13	05	14	03	02	12	20
90	22	15	01	29	3D	06	C0	15	07	50	09	57	07	7C	03
A0	00	10	00	B8	3C	20	C0	8E	01	02	03	04	01	4F	3F
B0	08	10	18	10	06	10	16	10	28	10	E3	05	03	01	02
C0	80	18	71	38	2D	40	58	2C	45	00	40	84	63	00	00
D0	01	1D	80	18	71	1C	16	20	58	2C	25	00	40	84	63
E0	00	9E	01	1D	00	72	51	D0	1E	20	6E	28	55	00	40
F0	63	00	00	1E	00	00	00	00	00	00	00	00	00	00	C0

## 4.2. White Balance Adjustment

### 4.2.1. Overview

- W/B adj. Objective & How-it-works
  - Objective: To reduce each Panel's W/B deviation
  - How-it-works : When R/G/B gain in the OSD is at 192, it means the panel is at its Full Dynamic Range. In order to prevent saturation of Full Dynamic range and data, one of R/G/B is fixed at 192, and the other two is lowered to find the desired value.
  - Adjustment condition : normal temperature
    - Surrounding Temperature : 25 °C ± 5 °C
    - Warm-up time: About 5 Min
    - Surrounding Humidity : 20 % ~ 80 %
    - Before White balance adjustment, Keep power on status, don't power off

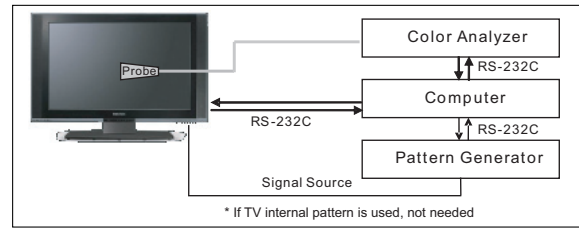
### 4.2.2. Adj. condition and cautionary items

- Lighting condition in surrounding area surrounding lighting should be lower 10 lux. Try to isolate adj. area into dark surrounding.
- Probe location: Color Analyzer (CA-210) probe should be within 10cm and perpendicular of the module surface (80°~ 100°)
- Aging time
  - After Aging Start, Keep the Power ON status during 5 Minutes.
  - In case of LCD, Back-light on should be checked using no signal or Full-white pattern.

### 4.2.3. Equipment

- Color Analyzer: CA-210 (LED Module : CH 14)
  - Adjustment Computer(During auto adj., RS-232C protocol is needed)
  - Adjustment Remote control
  - Video Signal Generator MSPG-925F 720p/216-Gray (Model: 217, Pattern: 49)
    - Only when internal pattern is not available
- Color Analyzer Matrix should be calibrated using CS-100.

## 4.2.4. Equipment connection MAP



## 4.2.5. Adj. Command (Protocol)

### <Command Format>

START	6E	A	50	A	LEN	A	03	A	CMD	A	00	A	VAL	A	CS	STOP
-------	----	---	----	---	-----	---	----	---	-----	---	----	---	-----	---	----	------

- LEN: Number of Data Byte to be sent
  - CMD: Command
  - VAL: FOS Data value
  - CS: Checksum of sent data
  - A: Acknowledge
- Ex) [Send: JA\_00\_DD] / [Ack: A\_00\_okDDX]

- RS-232C Command used during auto-adjustment.

RS-232C COMMAND [CMD ID DATA]			Explanation
wb	00	00	Begin White Balance adjustment
wb	00	10	Gain adjustment(internal white pattern)
wb	00	1f	Gain adjustment completed
wb	00	20	Offset adjustment(internal white pattern)
wb	00	2f	Offset adjustment completed
wb	00	ff	End White Balance adjustment (internal pattern disappears )

- Ex) wb 00 00 -> Begin white balance auto-adj.  
 wb 00 10 -> Gain adj.  
 ja 00 ff -> Adj. data  
 jb 00 c0  
 ...  
 ...  
 wb 00 1f → Gain adj. completed  
 \*(wb 00 20(Start), wb 00 2f(end)) → Off-set adj.  
 wb 00 ff → End white balance auto-adj.

- Adj. Map

	Adj. item	Command (lower caseASCII)		Data Range (Hex.)		Default (Decimal)
		CMD1	CMD2	MIN	MAX	
Cool	R Gain	j	g	00	C0	
	G Gain	j	h	00	C0	
	B Gain	j	i	00	C0	
	R Cut					
	G Cut					
	B Cut					
Medium	R Gain	j	a	00	C0	
	G Gain	j	b	00	C0	
	B Gain	j	c	00	C0	
	R Cut					
	G Cut					
	B Cut					
Warm	R Gain	j	d	00	C0	
	G Gain	j	e	00	C0	
	B Gain	j	f	00	C0	
	R Cut					
	G Cut					
	B Cut					

#### 4.2.6. Adj. method

##### (1) Auto adj. method

- 1) Set TV in adj. mode using POWER ON key.
  - 2) Zero calibrate probe then place it on the center of the Display.
  - 3) Connect Cable.(RS-232C to USB)
  - 4) Select mode in adj. Program and begin adj.
  - 5) When adj. is complete (OK Sign), check adj. status pre mode. (Warm, Medium, Cool)
  - 6) Remove probe and RS-232C cable to complete adj.
- W/B Adj. must begin as start command "wb 00 00" , and finish as end command "wb 00 ff", and Adj. offset if need.

##### (2) Manual adjustment method (84LA98)

- 1) Set TV in Adj. mode using POWER ON.
- 2) Zero Calibrate the probe of Color Analyzer, then place it on the center of LCD module within 10 cm of the surface.
- 3) Press ADJ key → EZ adjust using adj. R/C → 7. White-Balance then press the cursor to the right(key ►). When right key(►) is pressed 216 Gray internal pattern will be displayed
- 4) One of R Gain / G Gain / B Gain should be fixed at 192, and the rest will be lowered to meet the desired value.
- 5) Adj. is performed in COOL, MEDIUM, WARM 3 modes of color temperature.

##### \*\* G-fix adjustment

Adjust modes(Cool), Fix the G gain to 172(default data) and change the others (G/B Gain).

Adjust two modes(Medium/Warm), Fix the one of R/G/B gain to 192(default data) and decrease the others.

- If internal pattern is not available, use RF input. In EZ Adj. menu 7.White Balance, you can select one of 2 Test-pattern: ON, OFF. Default is inner(ON). By selecting OFF, you can adjust using RF signal in 216 Gray pattern

##### \* CASE Cool

First adjust the coordinate far away from the target value(x, y).

1. x, y > target
  - i) Decrease the R, G.
2. x, y < target
  - i) First decrease the B gain,
  - ii) Decrease the one of the others.
3. x > target, y < target
  - i) First decrease B, so make y a little more than the target.
  - ii) Adjust x value by decreasing the R
4. x < target, y > target
  - i) First decrease B, so make x a little more than the target.
  - ii) Adjust x value by decreasing the G

##### How to adjust

1. If G gain is adjusted over 172 and R gain and B gain less than 192 , Adjust is O.K.
2. If G gain is less than 172 , increase G gain by up to 172, and then increase R gain and B gain same amount of increasing G gain.
3. If R gain or B gain is over 255 , Readjust G gain less than 172, Conform to R gain is 255 or B gain is 255

##### \* CASE Medium / Warm

First adjust the coordinate far away from the target value(x, y).

1. x, y > target
  - i) Decrease the R, G.
2. x, y < target
  - i) First decrease the B gain,
  - ii) Decrease the one of the others.
3. x > target, y < target
  - i) First decrease B, so make y a little more than the target.
  - ii) Adjust x value by decreasing the R
4. x < target, y > target
  - i) First decrease B, so make x a little more than the target.
  - ii) Adjust y value by decreasing the G

#### 4.2.7. Reference (White balance Adj. coordinate and color temperature)

- Luminance : 216 Gray

- Standard color coordinate and temperature using CS-1000 (over 26 inch)

Mode	Coordinate		Temp	Δuv
	x	y		
Cool	0.271	0.270	13000 K	0.0000
Medium	0.285	0.293	9300 K	0.0000
Warm	0.310	0.325	6500 K	0.0000

- Standard color coordinate and temperature using CA-210(CH 18)

Mode	Coordinate		Temp	Δuv
	x	y		
Cool	0.271 ± 0.002	0.270 ± 0.002	13000 K	0.0000
Medium	0.285 ± 0.002	0.293 ± 0.002	9300 K	0.0000
Warm	0.310 ± 0.002	0.325 ± 0.002	6500 K	0.0000

#### 4.2.8. EDGE LED White balance table

- (1) EDGE LED module change color coordinate because of aging time.
- (2) Apply under the color coordinate table, for compensated aging time.
- (3) Normal line(Edge, Direct)  
- Gumi (Mar ~ Dec) & Global

NC4.0	Aging time (Min)	Cool		Medium		Warm	
		X	y	x	y	x	y
		271	270	285	293	313	329
1	0-2	281	287	295	310	320	342
2	3-5	280	285	294	308	319	340
3	6-9	278	284	292	307	317	339
4	10-19	276	281	290	304	315	336
5	20-35	275	277	289	300	314	332
6	36-49	274	274	288	297	313	329
7	50-79	273	272	287	295	312	327
8	80-119	272	271	286	294	311	326
9	Over 120	271	270	285	293	310	325

#### (4) Aging Chamber

NC4.0	Aging time (Min)	Cool		Medium		Warm	
		X	y	x	y	x	y
		271	270	285	293	313	329
1	0-5	280	285	294	308	319	340
2	6-10	276	280	290	303	315	335
3	11-20	272	275	286	298	311	330
4	21-30	269	272	283	295	308	327
5	31-40	267	268	281	291	306	323
6	41-50	266	265	280	288	305	320
7	51-80	265	263	279	286	304	318
8	81-119	264	261	278	284	303	316
9	Over 120	264	260	278	283	303	315

#### (5) Gumi winter table(Jan, Feb) - Gumi producing model use only (Normal line)

NC4.0	Aging time (Min)	Cool		Medium		Warm	
		X	y	x	y	x	y
		271	270	285	293	313	329
1	0-2	283	292	297	315	322	347
2	3-5	282	290	296	313	321	345
3	6-9	280	288	294	311	319	343
4	10-19	277	284	291	307	316	339
5	20-35	275	279	289	302	314	334
6	36-49	274	275	288	298	313	330
7	50-79	273	272	287	295	312	327
8	80-119	272	271	286	294	311	326
9	Over 120	271	270	285	293	310	325

#### (aging chamber)

NC4.0	Aging time (Min)	Cool		Medium		Warm	
		X	y	x	y	x	y
		271	270	285	293	313	329
1	0-5	280	285	294	308	319	340
2	6-10	276	280	290	303	315	335
3	11-20	272	275	286	298	311	330
4	21-30	269	272	283	295	308	327
5	31-40	267	268	281	291	306	323
6	41-50	266	265	280	288	305	320
7	51-80	265	263	279	286	304	318
8	81-119	264	261	278	284	303	316
9	Over 120	264	260	278	283	303	315

#### 4.3. Local Dimming Function Check

- Step 1) Turn on TV.
- Step 2) Press "TILT" key on the Adj. R/C
- Step 3) At the Local Dimming mode, module Edge Backlight moving left to right. Back light of IOP module moving
- Step 4) confirm the Local Dimming mode.
- Step 5) Press "exit" key.



Local Dimming Demo.  
(Edge LED Model)

#### 4.4. Magic Motion Remote control test

- (1) Equipment : RF Remote control for test, IR-KEY-Code Remote control for test
- (2) You must confirm the battery power of RF-Remote control before test(recommend that change the battery per every lot)
- (3) Sequence (test)
  - 1) if you select the 'start key(wheel)' on the controller, you can pairing with the TV SET.
  - 2) You can check the cursor on the TV Screen, when select the 'Wheel Key' on the control.
  - 3) You must remove the pairing with the TV Set by select 'Back + Home Key' on the control.

#### 4.5. 3D function test

(Pattern Generator MSHG-600, MSPG-6100[Support HDMI1.4])

\* HDMI mode NO. 872 , pattern No.83

- (1) Please input 3D test pattern like below.



- (2) When 3D OSD appear automatically, then select green key.



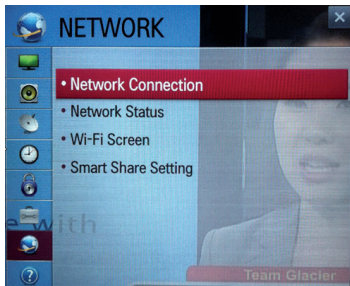
- (3) Don't wear a 3D Glasses, check the picture like below.



## 4.6. Wi-Fi Test

Step 1) Turn on TV

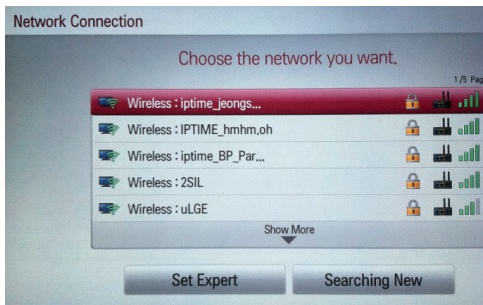
Step 2) Select Network Connection option in Network Menu.



Step 3) Select Start Connection button in Network Connection.



Step 4) If the system finds any AP like blow PIC, it is working well.



## 4.7. LNB voltage and 22KHz tone check

(only for DVB-S/S2 model)

▪ Test method

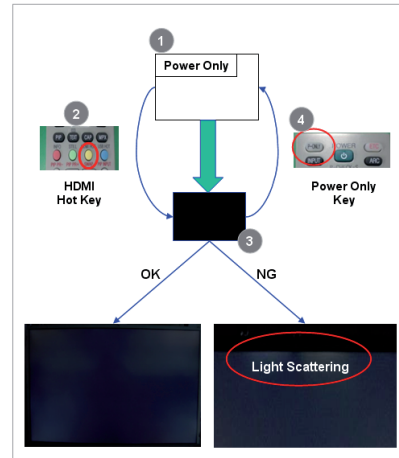
- (1) Set TV in Adj. mode using POWER ON.
- (2) Connect cable between satellite ANT and test JIG.
- (3) Press Yellow key(ETC+SWAP) in Adj Remote control to make LNB on.
- (4) Check LED light 'ON' at 18 V menu.
- (5) Check LED light 'ON' at 22 KHz tone menu.
- (6) Press Blue key(ETC+PIP INPUT) in Adjustment Remote control to make LNB off.
- (7) Check LED light 'OFF' at 18 V menu.
- (8) Check LED light 'OFF' at 22 KHz tone menu.

▪ Test result

- (1) After press LNB On key, '18 V LED' and '22 KHz tone LED' should be ON.
- (2) After press LNB OFF key, '18 V LED' and '22 KHz tone LED' should be OFF.

## 4.8. Inspection of light scattering

▪ Test Method



- (1) Push "Power only" key.
- (2) Push "HDMI" hot key.
- (3) Inspect whether light scattering is occurred in internal black pattern or not.
- (4) Push "Power only" key.

## 4.9. Option selection per country

### 4.9.1. Overview

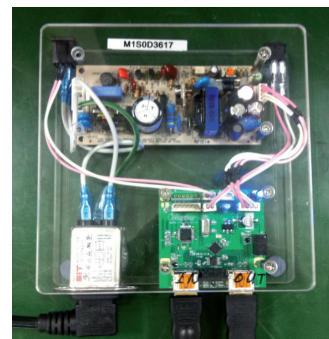
- Option selection is only done for models in Non-EU.

### 4.9.2. Method

- (1) Press ADJ key on the Adjustment Remote Control, then select Country Group Menu
- (2) Depending on destination, select Country Group Code 04 or Country Group EU then on the lower Country option, select US, CA, MX. Selection is done using +, - or ►◄ key.

## 4.10. MHL Test

- (1) Turn on TV
- (2) Select HDMI4 mode using input Menu.
- (3) Set MHL Zig(M1S0D3617) using MHL input, output and power cord.
- (4) Connect HDMI cable between MHL Zig and HDMI4 port.
- (5) Check LED light of Zig and Module of Set.



Result) If, the LED light is green and the Module shows normal stream → OK, Else → NG



#### 4.11. HDMI ARC Function Inspection

(1) Test equipment

- Optic Receiver Speaker
- MSHG-600 (SW: 1220 ↑)
- HDMI Cable (for 1.4 version)

(2) Test method

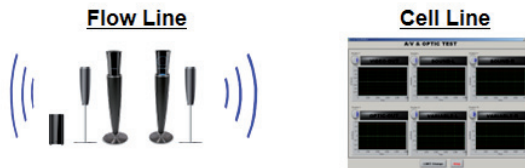
- 1) Insert the HDMI Cable to the HDMI ARC port from the master equipment (HDMI1)



- 2) Check the sound from the TV Set



- 3) Check the Sound from the Speaker or using AV & Optic TEST program (It's connected to MSHG-600)



- \* Remark: Inspect in Power Only Mode and check SW version in a master equipment



#### 4.12. Ship-out mode check(In-stop)

- After final inspection, press "IN-STOP" key of the Adjustment remote control and check that the unit goes to Stand-by mode.

#### 4.13. Tool Option selection

- Method: Press ADJ key on the Adj. R/C, then select Tool option.

#### 4.14. GND and Internal Pressure check

##### 4.14.1. Method

- (1) GND & Internal Pressure auto-check preparation

- Check that Power cord is fully inserted to the SET.  
(If loose, re-insert)

- (2) Perform GND & Internal Pressure auto-check

- Unit fully inserted Power cord, Antenna cable and A/V arrive to the auto-check process.
- Connect D-terminal to AV JACK TESTER
- Auto CONTROLLER(GWS103-4) ON
- Perform GND TEST
- If NG, Buzzer will sound to inform the operator.
- If OK, changeover to I/P check automatically.  
(Remove CORD, A/V form AV JACK BOX.)
- Perform I/P test
- If NG, Buzzer will sound to inform the operator.
- If OK, Good lamp will lit up and the stopper will allow the pallet to move on to next process.

##### 4.14.2. Checkpoint

- TEST voltage
  - GND: 1.5 KV / min at 100 mA
  - SIGNAL: 3 KV / min at 100 mA
- TEST time: 1 second
- TEST POINT
  - GND TEST = POWER CORD GND & SIGNAL CABLE METAL GND
  - Internal Pressure TEST = POWER CORD GND & LIVE & NEUTRAL
- LEAKAGE CURRENT: At 0.5 mArms

#### 5. Audio

No.	Item	Min	Typ	Max	Unit	Remark
1.	Audio practical max Output, L/R (Distortion=10% max Output)	9.0	10.0	12.0	W	Measurement condition
		8.5	8.9	9.8	Vrms	Auto Volume :Off Audio EQ : Off Clear Voice : Off Virtual Surround:Off
2.	Speaker (8 $\Omega$ Impedance)		10.0	15.0	W	

Measurement condition:

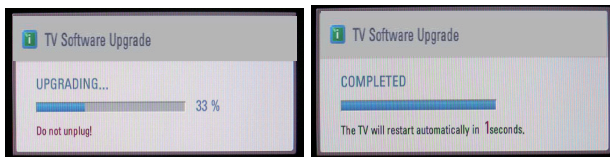
- (1) RF input: Mono, 1 KHz sine wave signal, 100 % Modulation  
 (2) CVBS, Component: 1 KHz sine wave signal 0.5 Vrms  
 (3) RGB PC: 1 KHz sine wave signal 0.7 Vrms

## 6. USB S/W Download(Service only)

- (1) Put the USB Stick to the USB socket.
- (2) Automatically detecting update file in USB Stick.
  - If your downloaded program version in USB Stick is Low, it didn't work. But your downloaded version is High, USB data is automatically detecting.(Download Version High & Power only mode, Set is automatically Download)
- (3) Show the message "Copying files from memory".




- (4) Updating is starting.

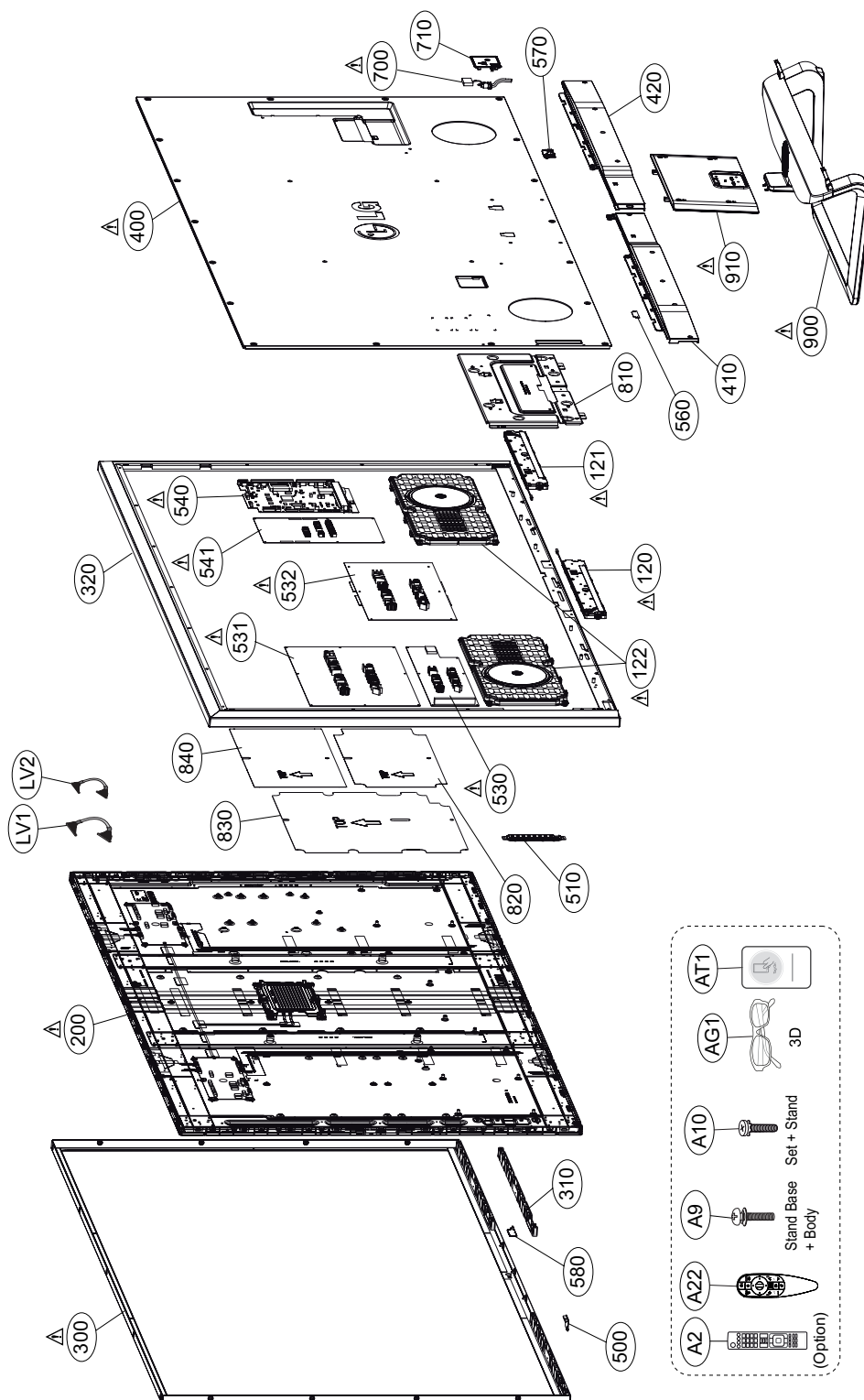


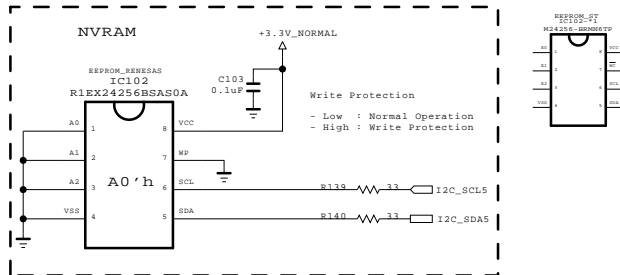
- (5) Updating Completed, The TV will restart automatically.
  - (6) If your TV is turned on, check your updated version and Tool option. (explain the Tool option, next stage)
- \* If downloading version is more high than your TV have, TV can lost all channel data. In this case, you have to channel recover. if all channel data is cleared, you didn't have a DTV/ ATV test on production line.
- \* After downloading, have to adjust Tool Option again.
- (1) Push "IN-START" key in service remote control.
  - (2) Select "Tool Option 1" and push "OK" key.
  - (3) Punch in the number. (Each model has their number)

## EXPLODED VIEW

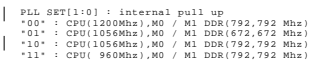
## IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by  in the Schematic Diagram and EXPLODED VIEW. It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards. Do not modify the original design without permission of manufacturer.

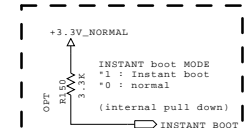
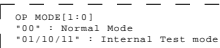


[illegible][illegible]

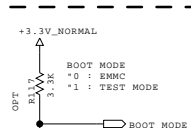
```
PLL SET[1:0] : internal pull up
*00* : CPU(1200Mhz),M0 / M1 DDR(792,792 Mhz)
*01* : CPU(1056Mhz),M0 / M1 DDR(672,672 Mhz)
*10* : CPU(1056Mhz),M0 / M1 DDR(792,792 Mhz)
*11* : CPU( 960Mhz),M0 / M1 DDR(792,792 Mhz)
```



```
OP MODE[1:0]
*00* : Normal Mode
*01/10/11* : Internal Test mode
```



+3.3V\_NORMAL  
 INSTANT boot MODE  
 \*1 : Instant boot  
 \*0 : normal  
 (internal pull down)  
 INSTANT BOOT



+3.3V\_NORMAL

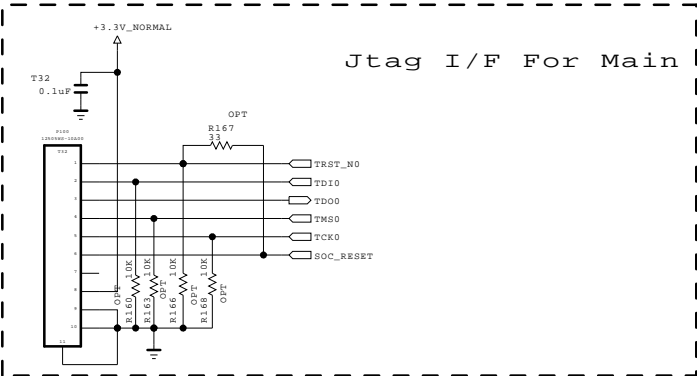
3.3K

OPT

BOOT MODE

"0 : EMMC

"1 : TEST MODE

[illegible]

Model Option

3.3V\_NORMAL

HW\_OPT\_0

HW\_OPT\_1

HW\_OPT\_2

HW\_OPT\_3

HW\_OPT\_4

HW\_OPT\_5

HW\_OPT\_6

HW\_OPT\_7

HW\_OPT\_8

HW\_OPT\_9

HW\_OPT\_10

AREA option1

FRC option

Panel Resol

OLED option

EPI PANEL version

reserved

CP BOX

T2 support

satellite support

AREA option2

EPI selection

V12\_MODULE

V12\_MODULE\_T2\_SUPPORT

CP BOX

DVB\_T2\_SUPPORT

DVB\_S\_T2\_SUPPORT

DVB\_T2\_SUPPORT

NON-TAISHAN R109

TAISHAN R106

R111

R113

R115

R117

R119

R121

R123

R125

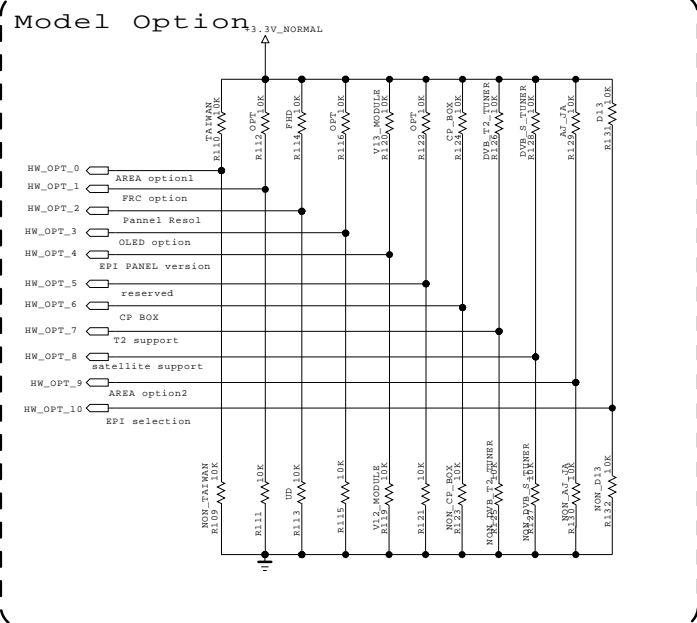
R127

R129

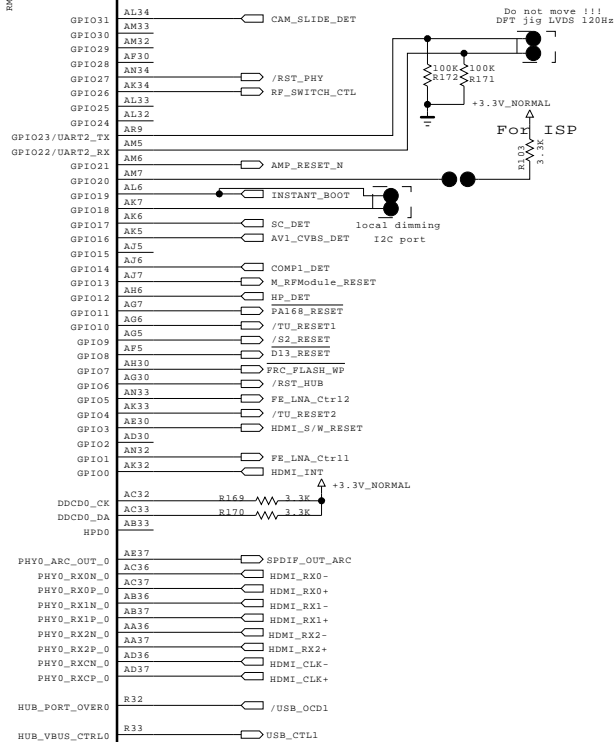
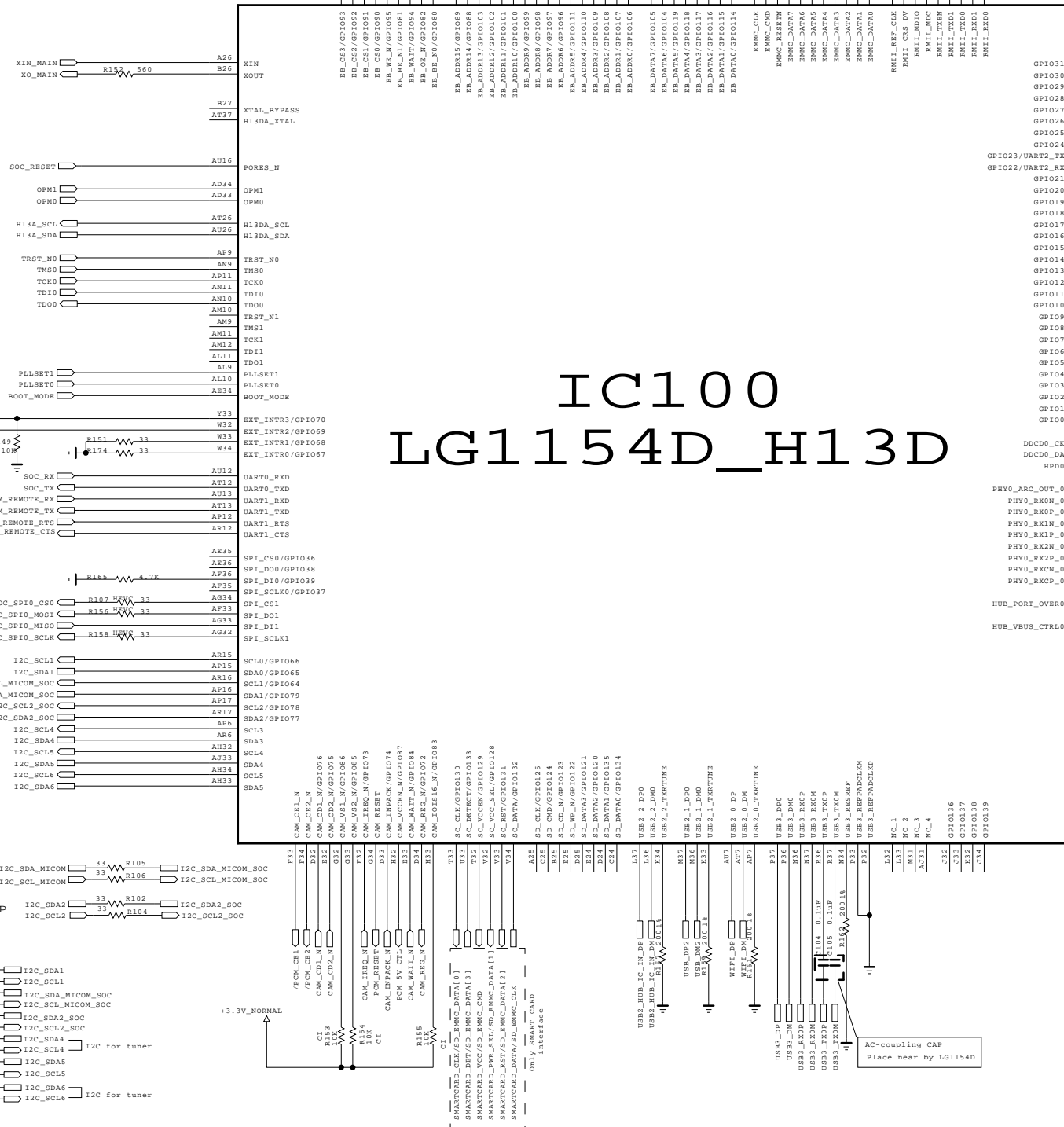
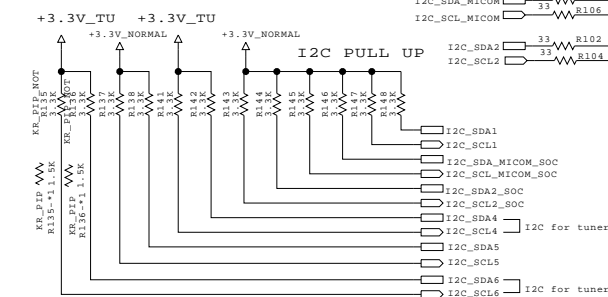
R131

R133



R135



		HIGH	LOW
MODEL_OPT_0	Area1	Taiwan	non Taiwan
MODEL_OPT_1	Reserved		Default
MODEL_OPT_2	Panel	FHD	UD
MODEL_OPT_3	Reserved		Default
MODEL_OPT_4	Module	V13	V12
MODEL_OPT_5	Reserved		Default
MODEL_OPT_6	CP BOX	Enable	Disable
MODEL_OPT_7	T2 Tuner	Support	Not Support
MODEL_OPT_8	S Tuner	Support	Not Support
MODEL_OPT_9	Area2	AJ_JA	non AJ_JA
MODEL_OPT_10	D13(REVC)	Support	Not Support



IC100  
LG1154D H13D

THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET  
G Electronics



BSD-NC4\_H001-HD

MODEL  
BLOCK

H13 D CHIP

DATE  
SHEET

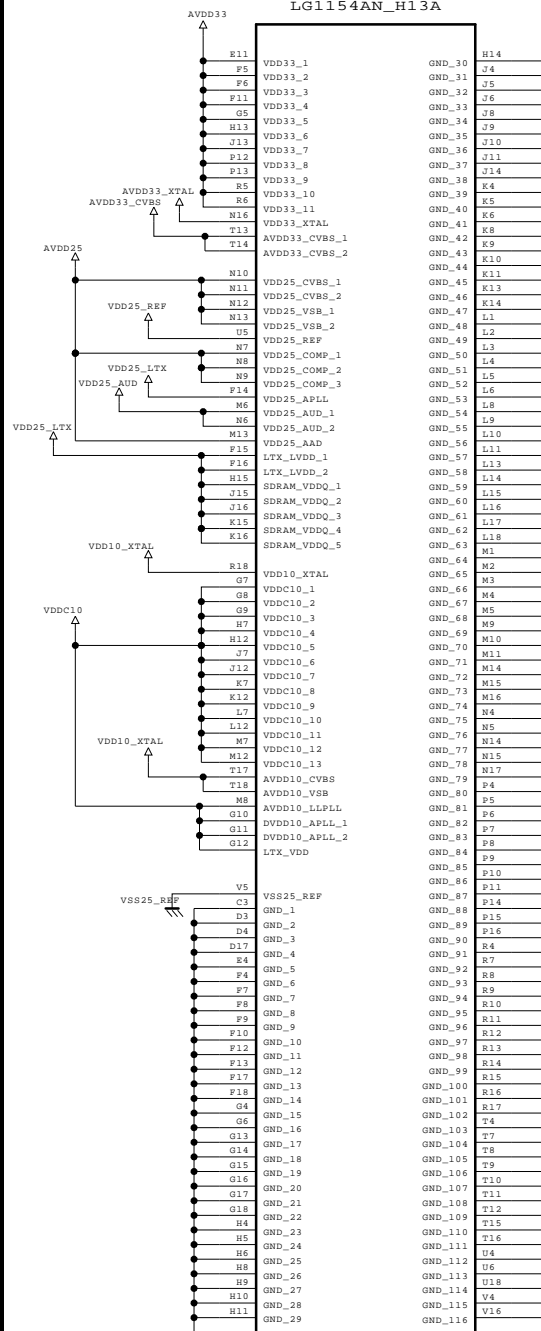
2012-11-14

# LG1154A      LG1154D

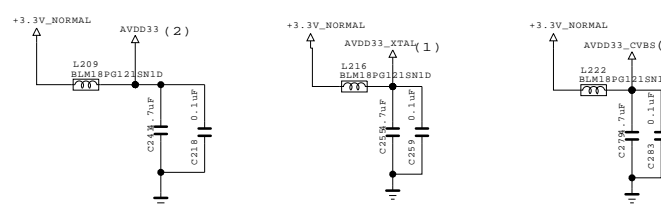
## LG1154A

### H13A\_NON\_BRAZIL

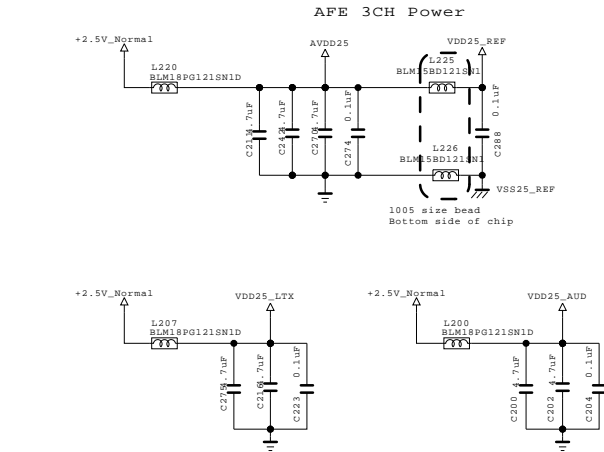
#### IC101 LG1154AN\_H13A



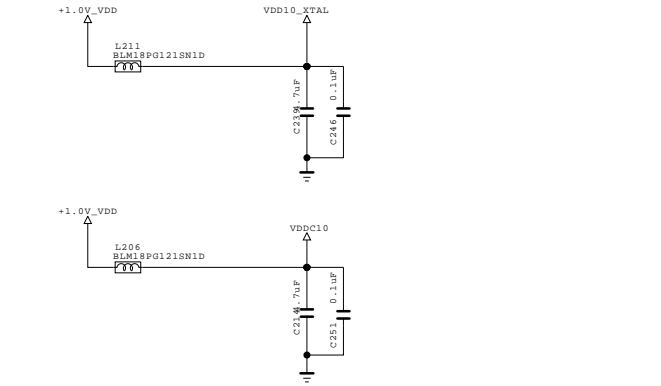
#### +3.3V\_Bypass Cap



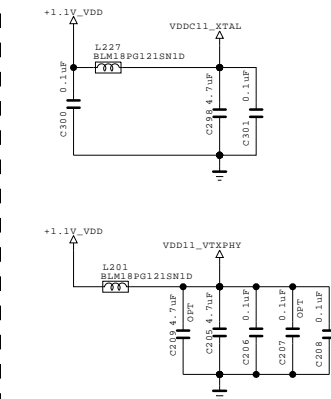
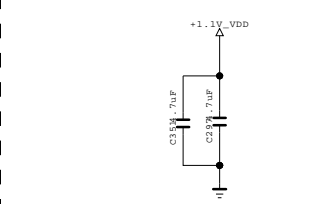
#### +2.5V\_Bypass Cap



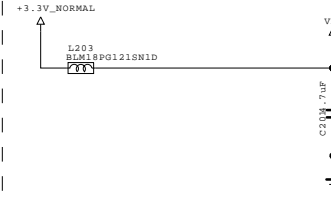
#### +1.0V\_Bypass Cap



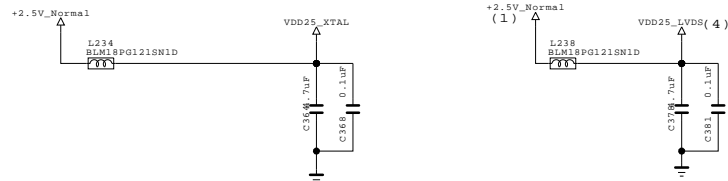
#### +1.1V\_Bypass Cap



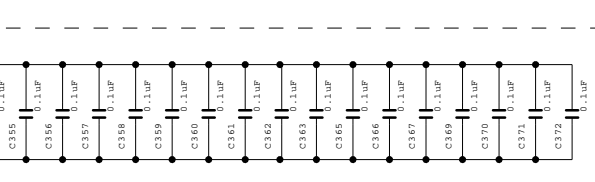
#### +3.3V\_Bypass Cap



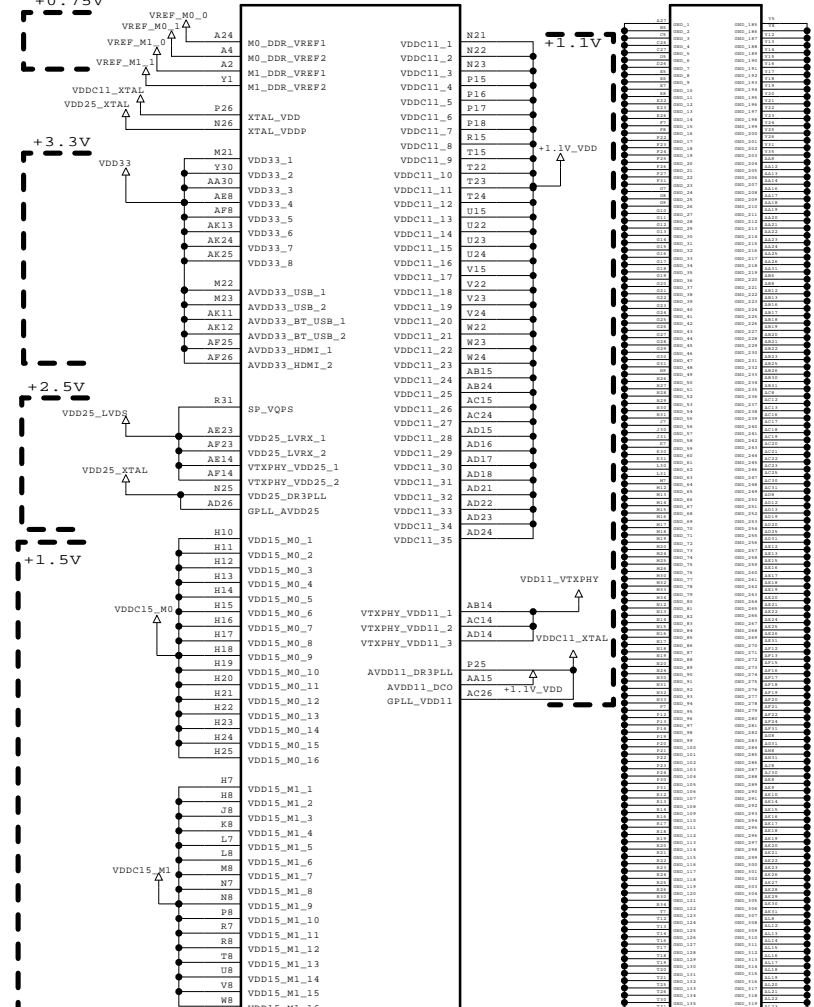
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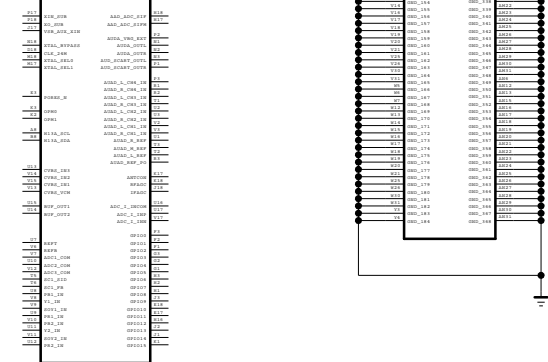
#### +1.5V\_Bypass Cap



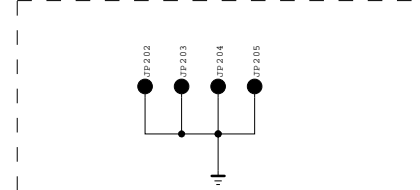
#### IC100 LG1154D\_H13D



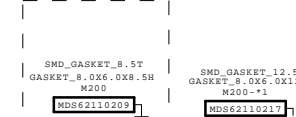
#### H13A\_BRAZIL LG1154AN\_H13A\_SDR-T (LG1154AN-IT)



#### GND JIG POINT



#### SMD TOP for EMI



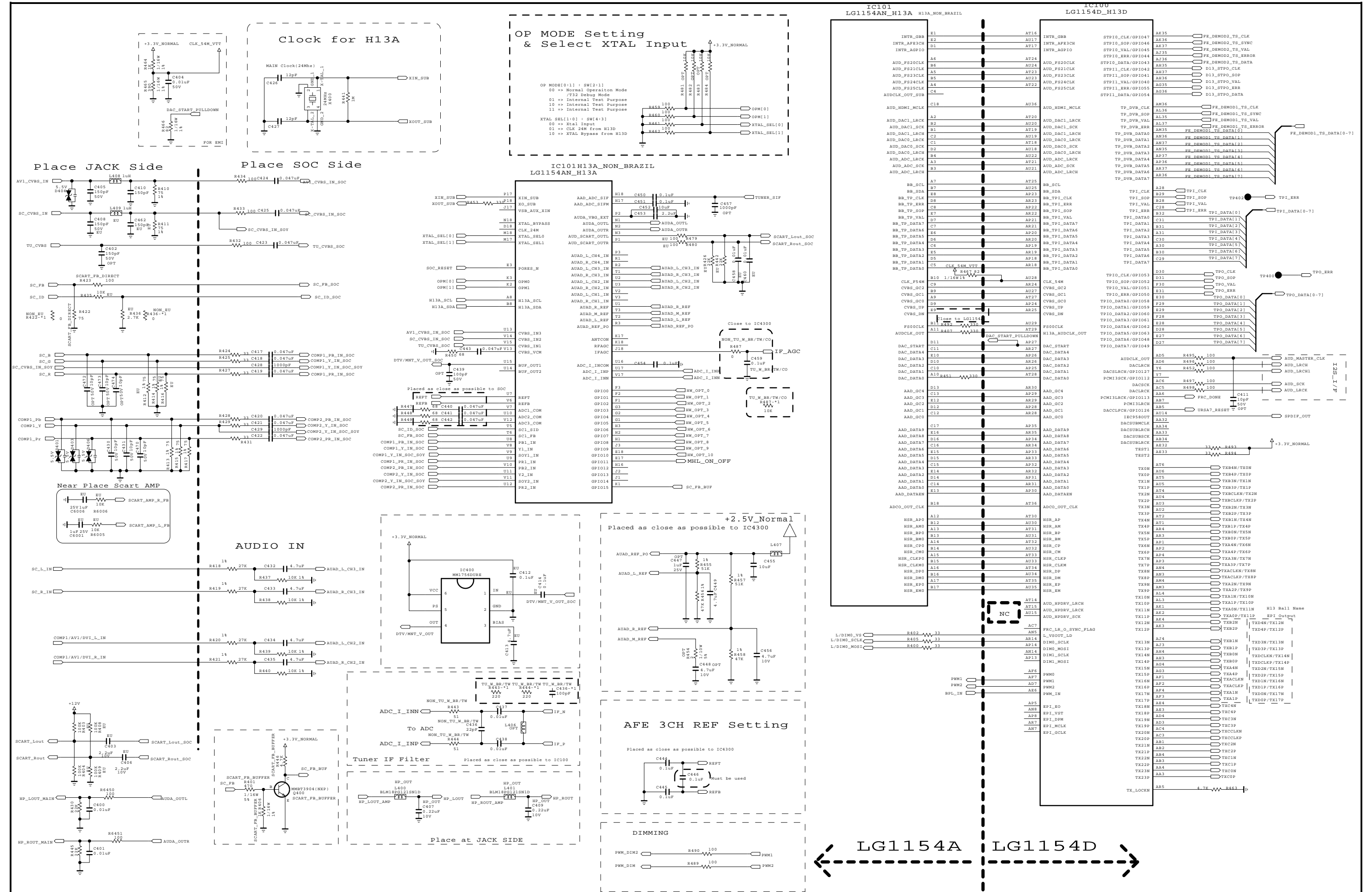
THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILTRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.



SECRET  
LGElectronics

LG ELECTRONICS

MODEL		DATE	2012-10-18
BLOCK	MAIN POWER	SHEET	

BSD-NC4\_H002-HD



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILTRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET  
LGElectronics

LG ELECTRONICS

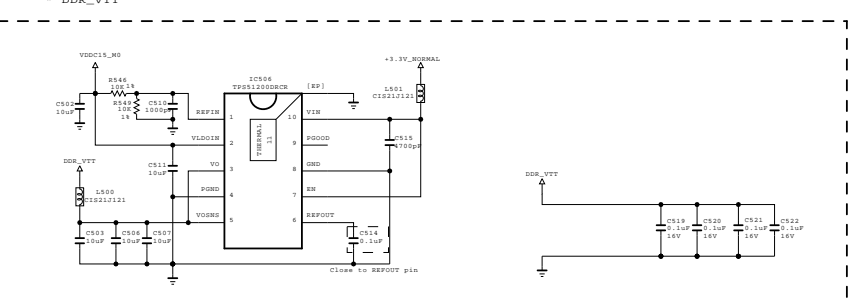
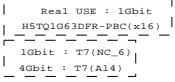
MODEL  
BLOCK

MAIN AUDIO/VIDEO

DATE  
SHEET

2012-11-13

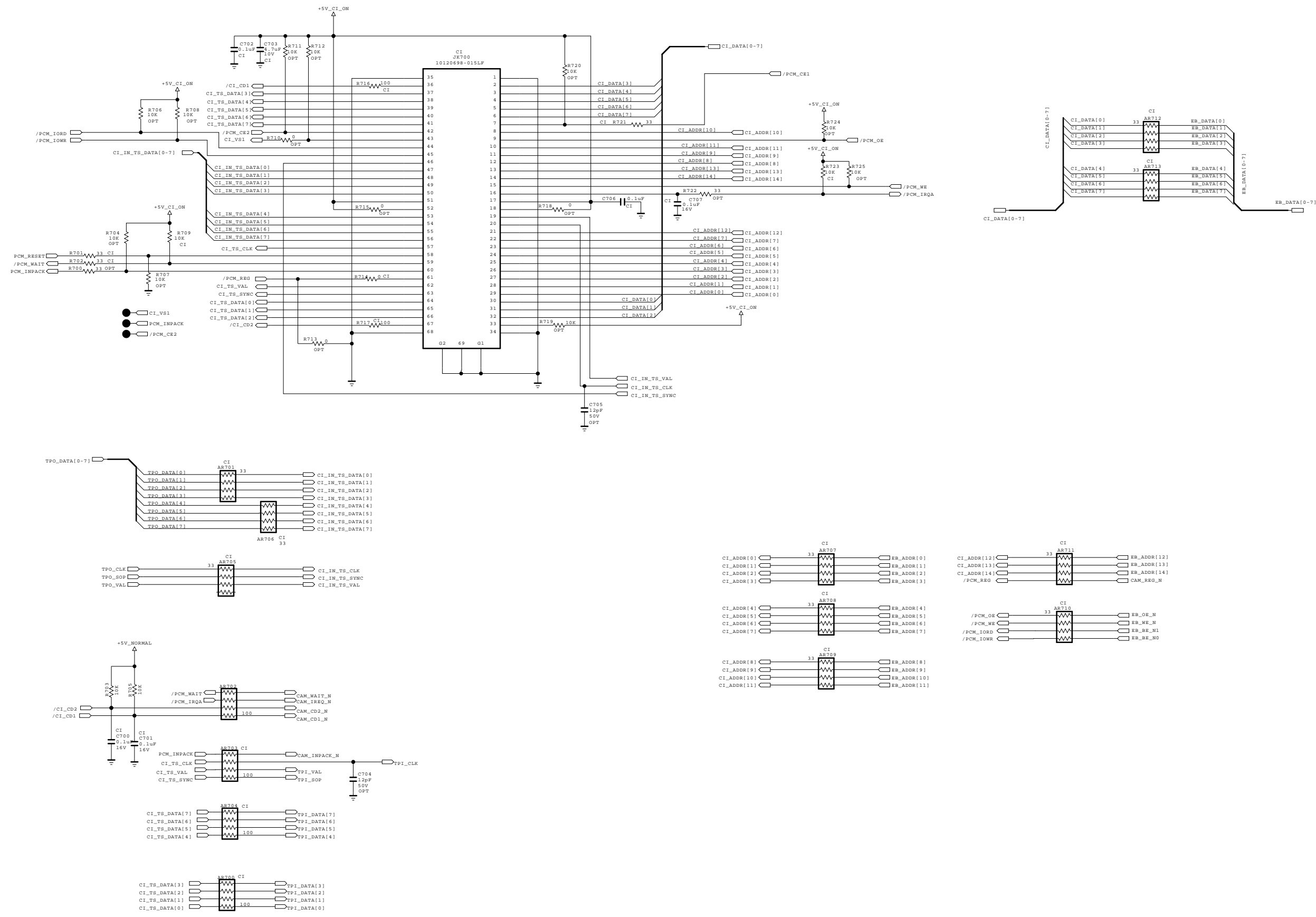
BSD-NC4\_H004-HD





SECRET  
LGElectronics



MODEL		DATE	2012-09-14
BLOCK	MAIN DDR	SHEET	/



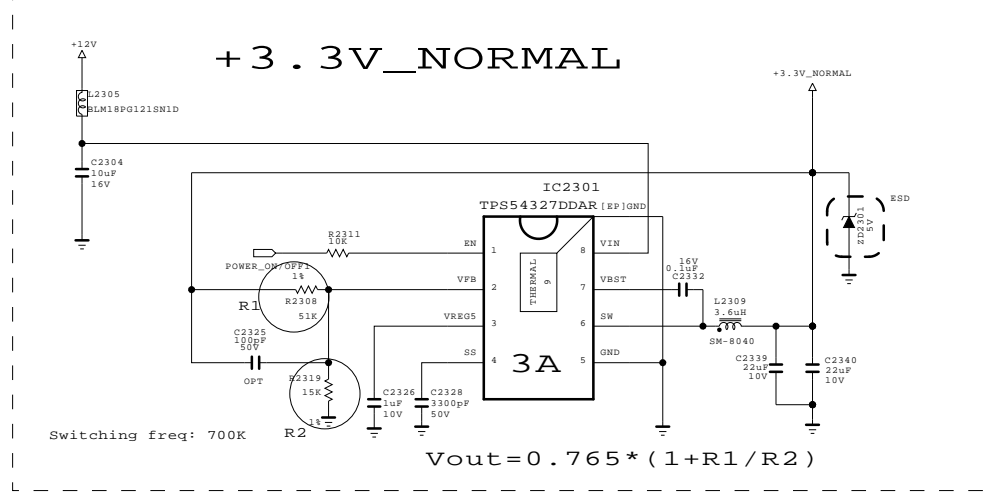
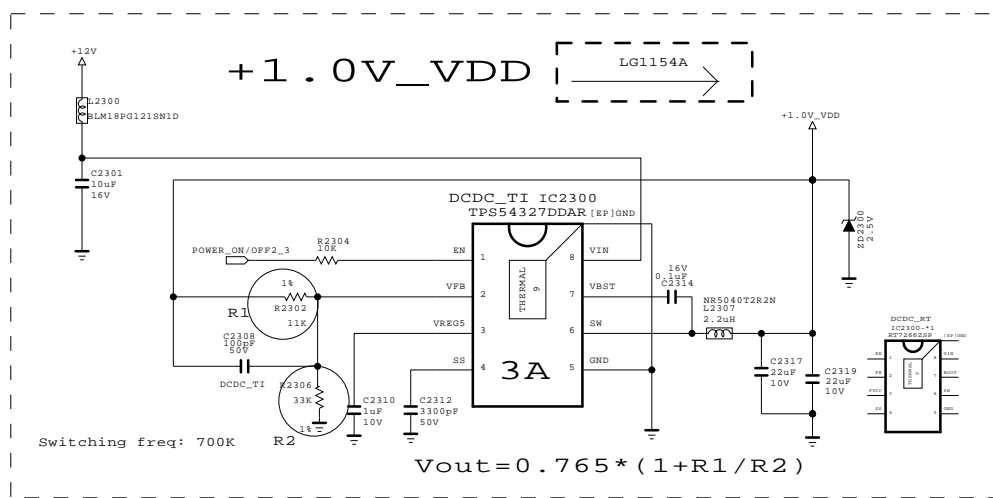
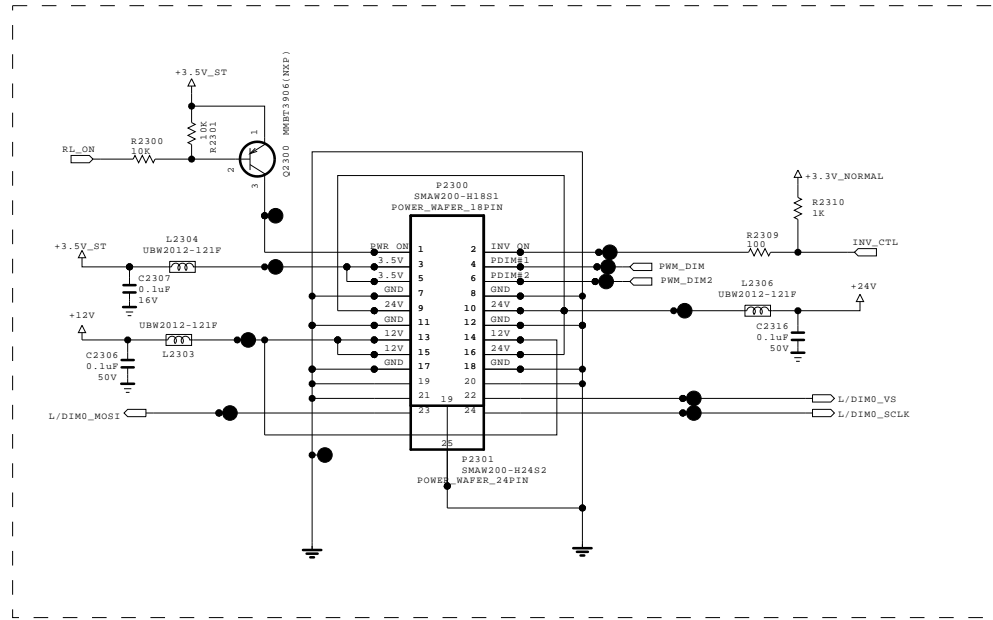
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILTRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET  
LGElectronics



MODEL		DATE	2012-10-20
BLOCK	PCMCI A	SHEET	/

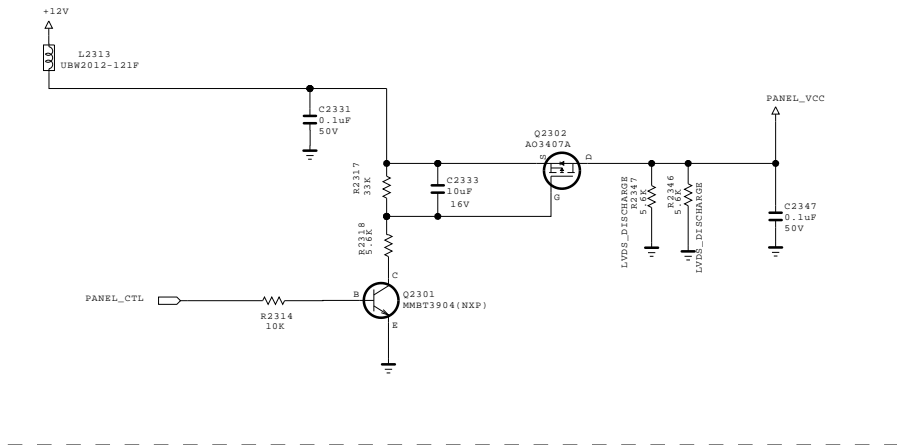




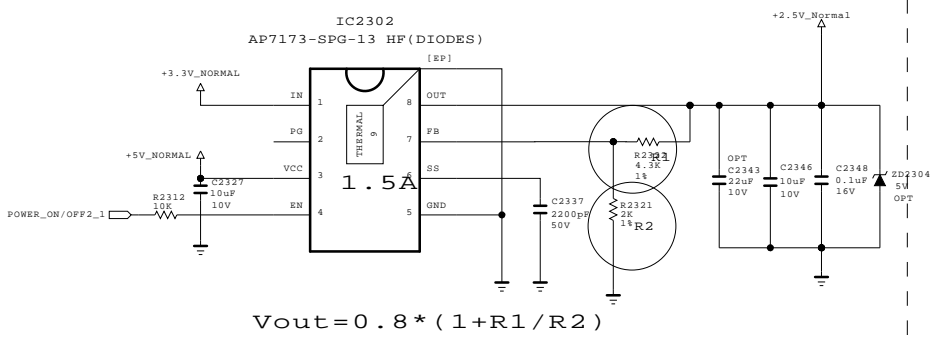
THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.

SECRET  
LGElectronics

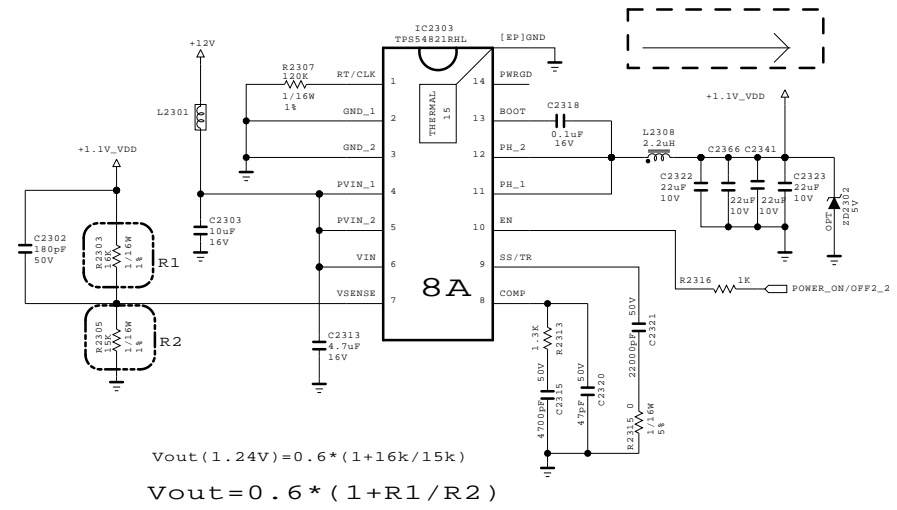
## PANEL\_POWER



## +2.5V



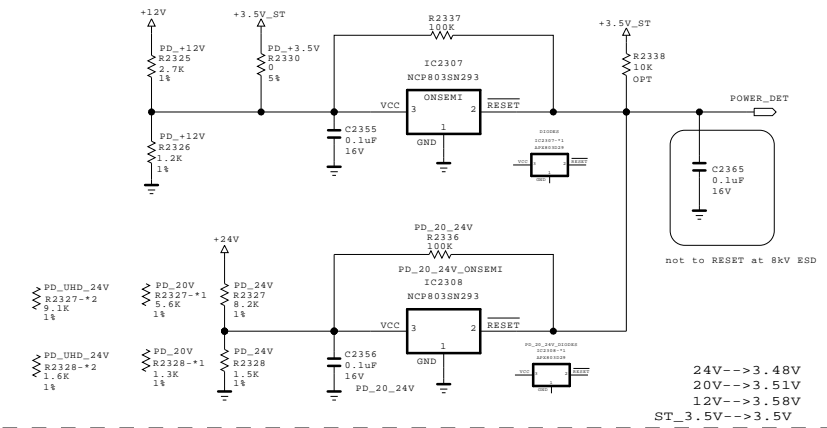
## +1.23V\_CORE



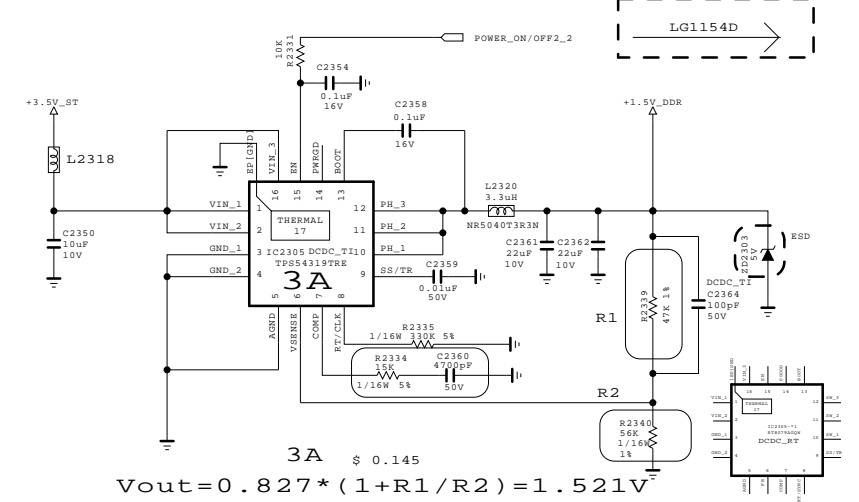
### POWER UP SEQUENCE

5V/3.3V->2.5V->1.5V/1.1V->1.0V  
 LG1154D : 3.3V->2.5V->1.5V->1.1V  
 LG1154AN : 3.3V->2.5V->1.0V

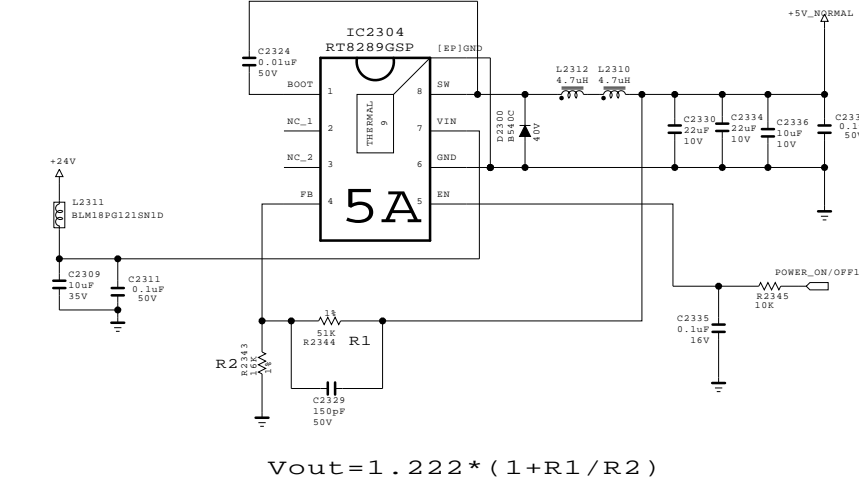
## Power\_DET



## DDR MAIN 1.5V



## +5.0V normal & USB

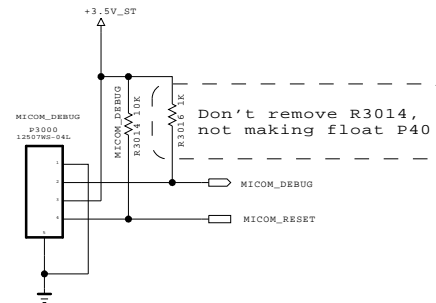


BSD-NC4\_H023-HD

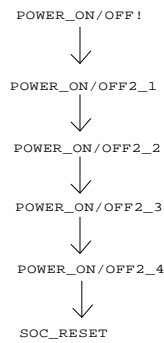
MODEL	LG1154	DATE	2012-12-07
BLOCK	POWER	SHEET	/

## Renesas MICOM

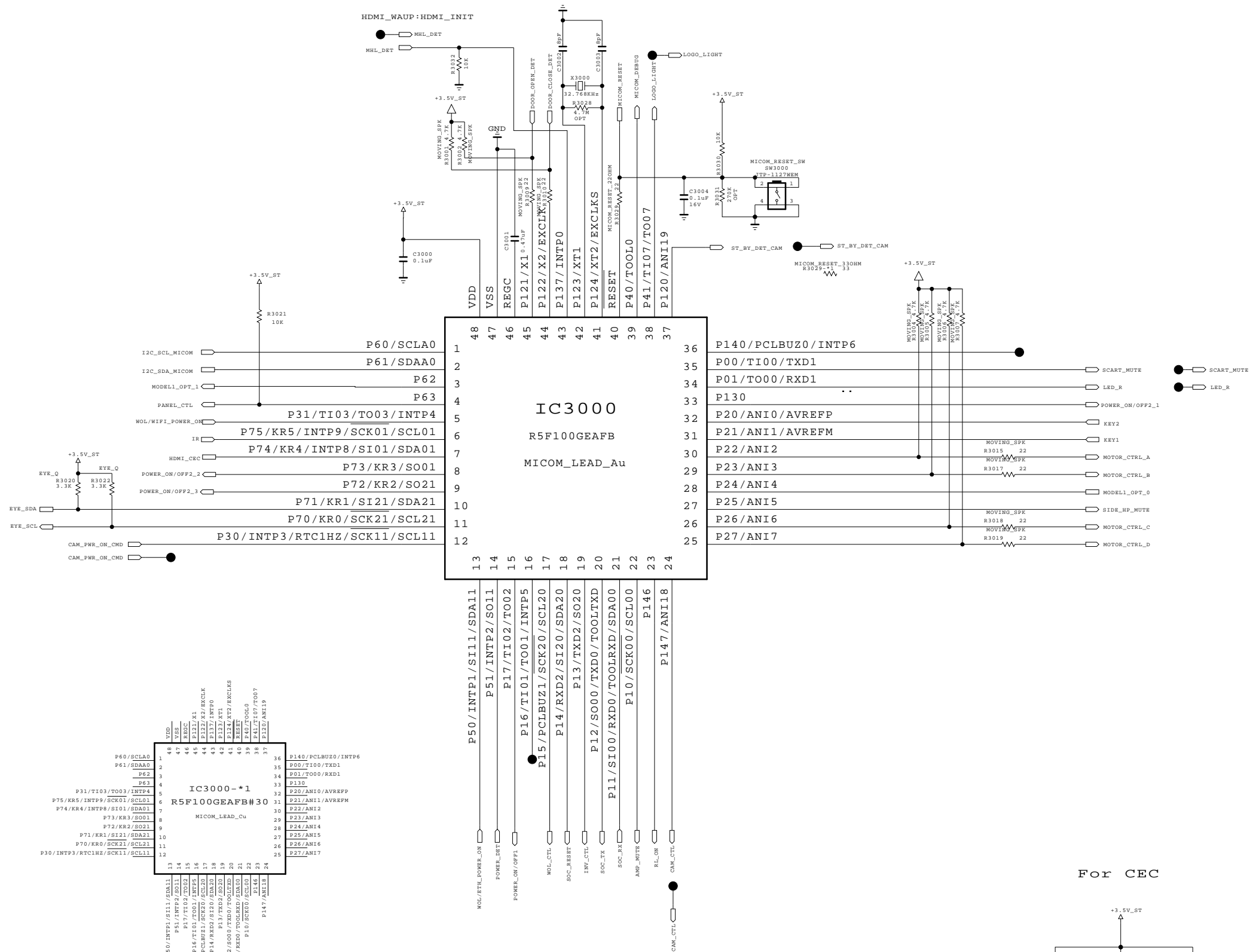
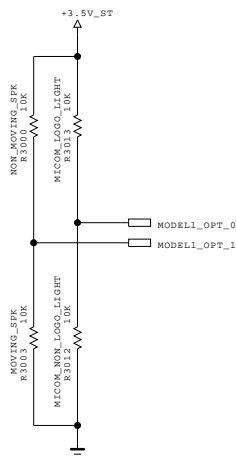
For Debug



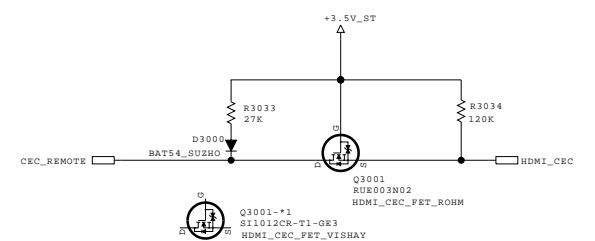
## GP4 High/MID Power SEQUENCE



## MICOM MODEL OPTION



For CEC



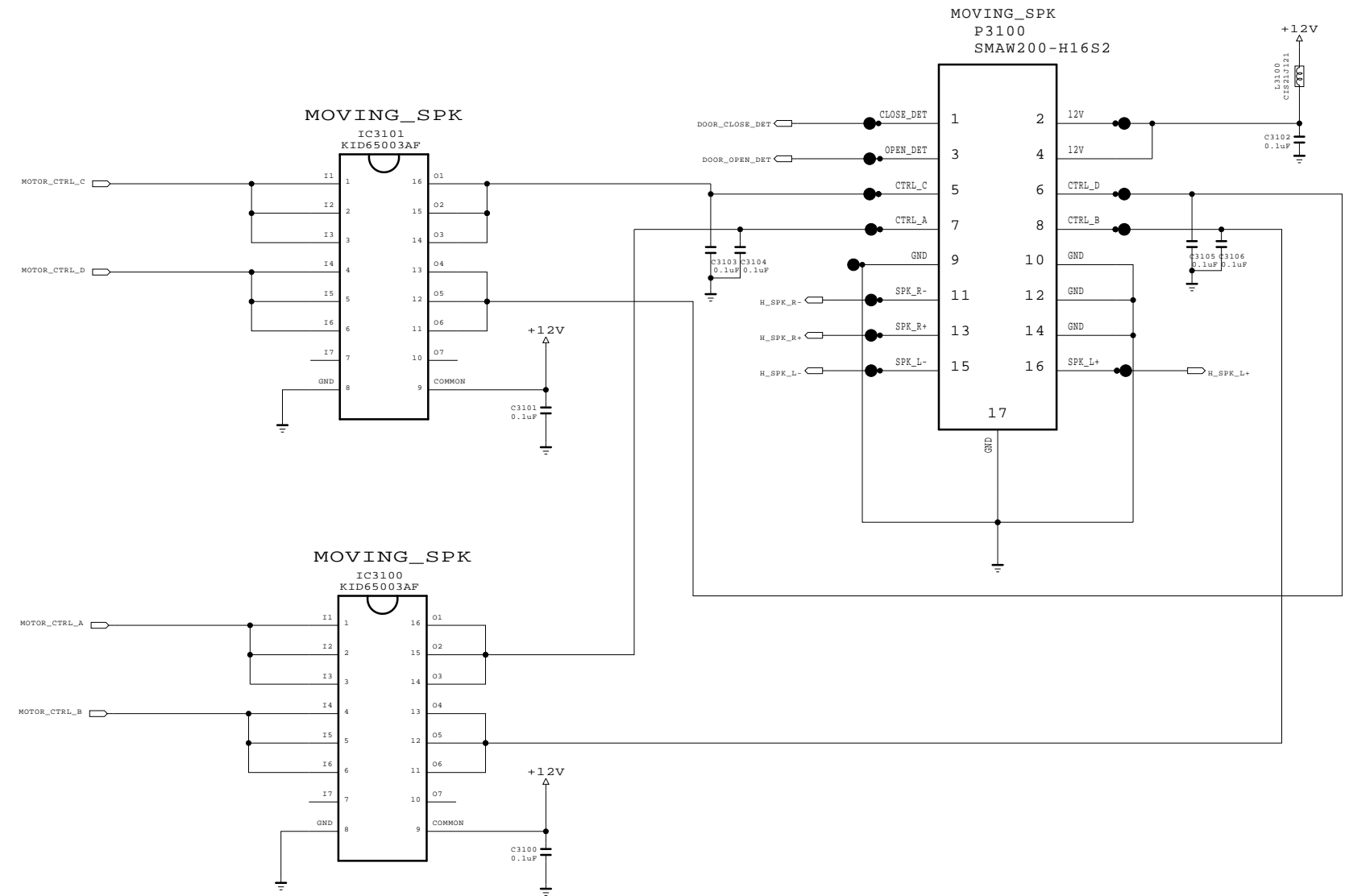
THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FIRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.



SECRET  
G Electronics



MODEL		DATE	2012.02.22
BLOCK	MICOM	SHEET	30 /

DOOR MOTOR Sheet option : MOVING\_SPK

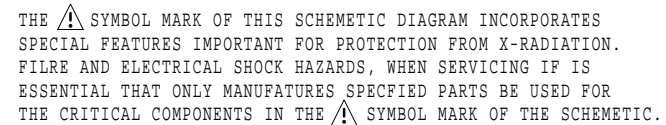
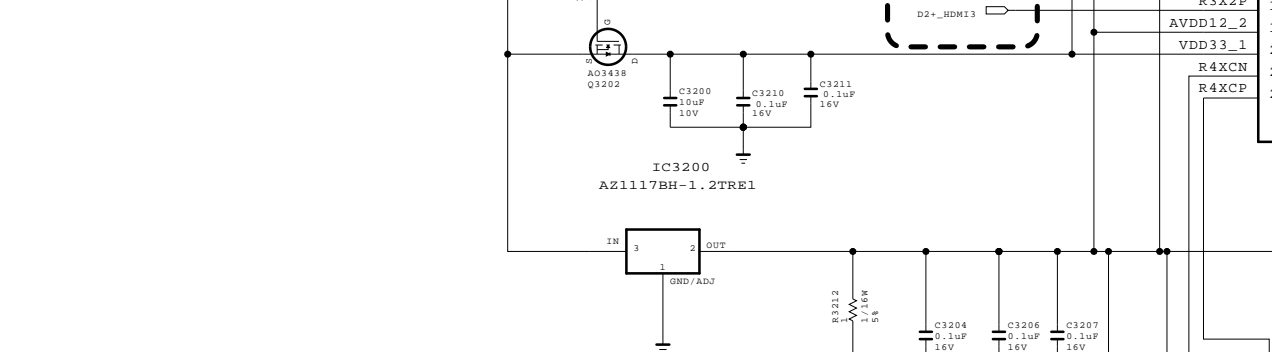
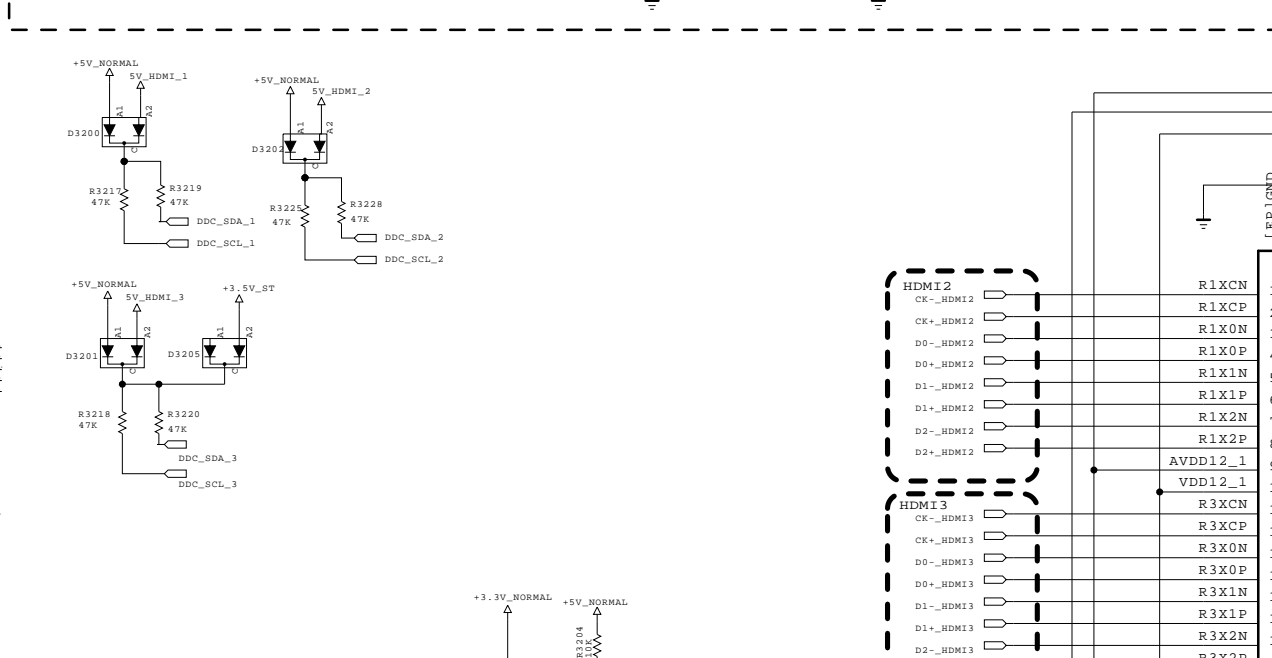
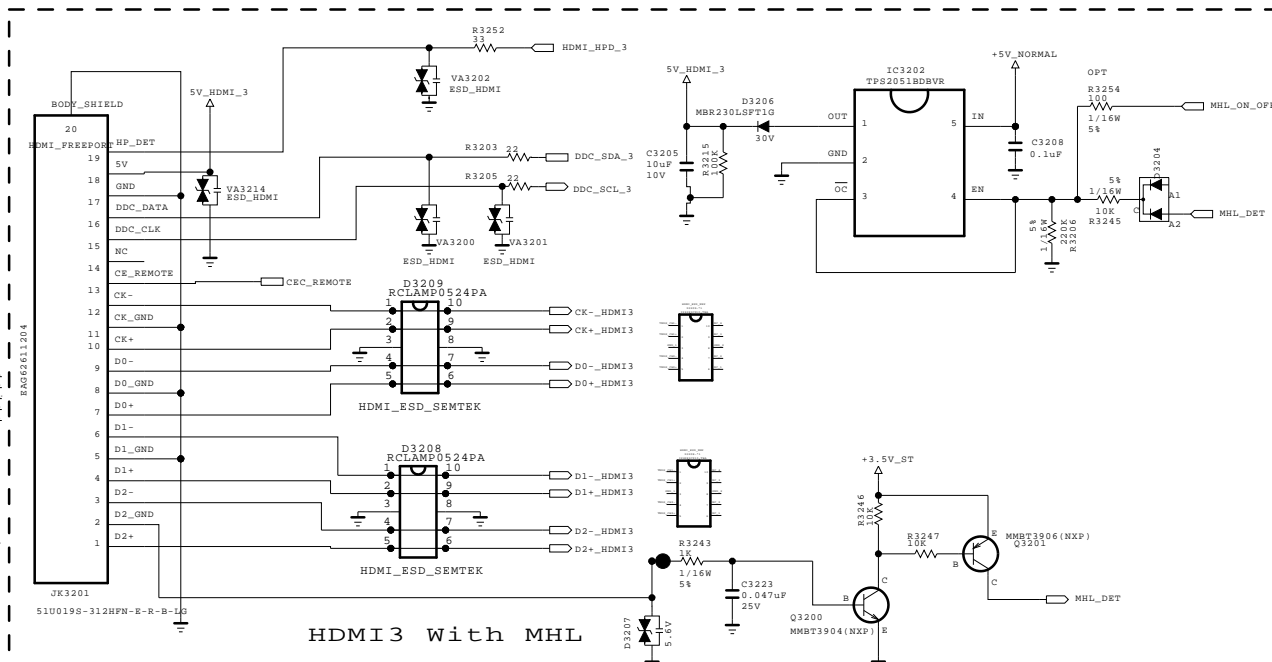


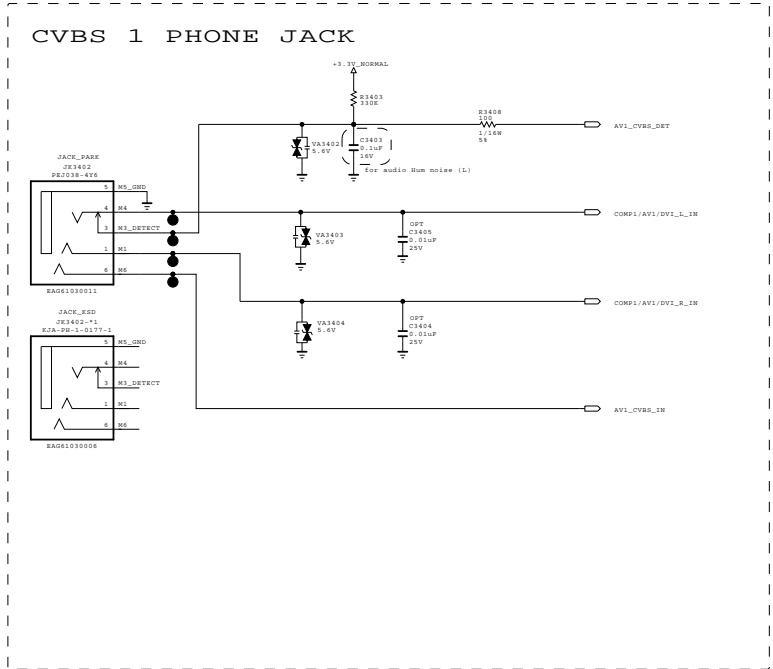
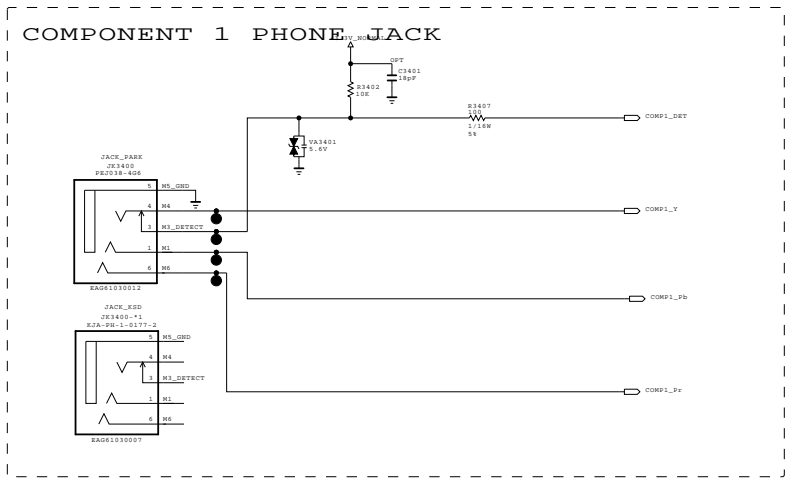
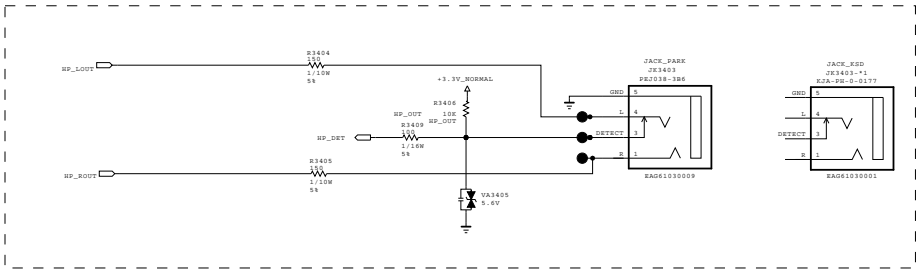
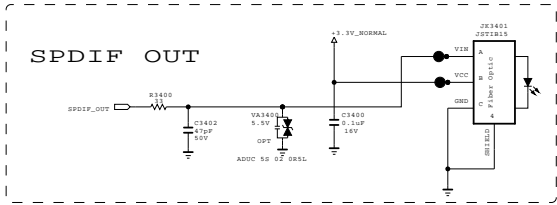
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SECRET  
LGElectronics



MODEL	GP4	DATE	
BLOCK	Motor	SHEET	31 /





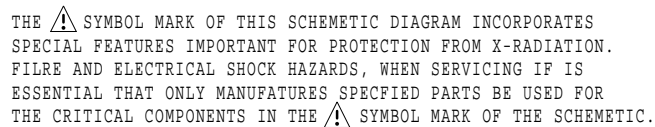
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SECRET  
LGElectronics

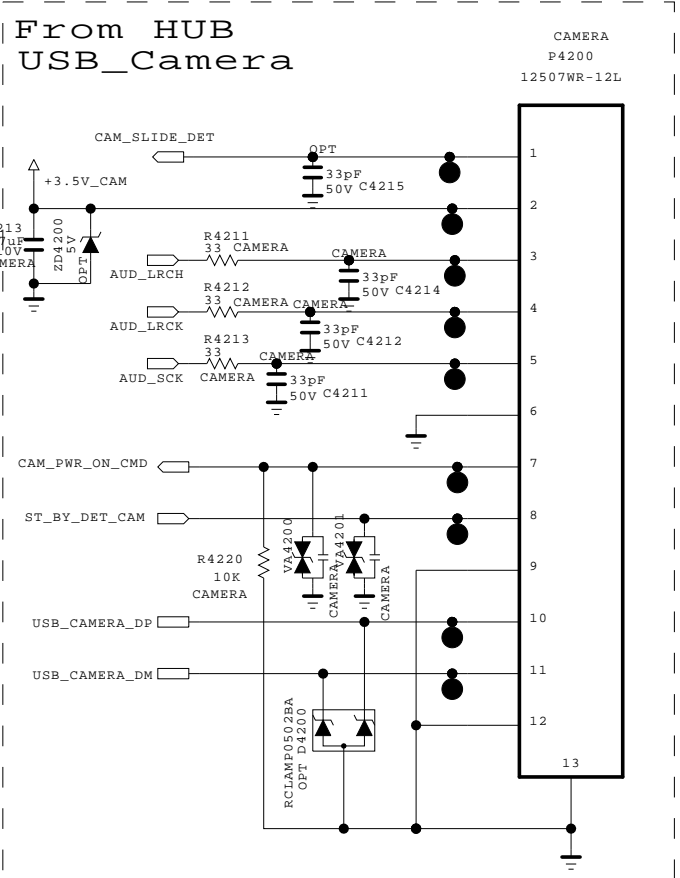
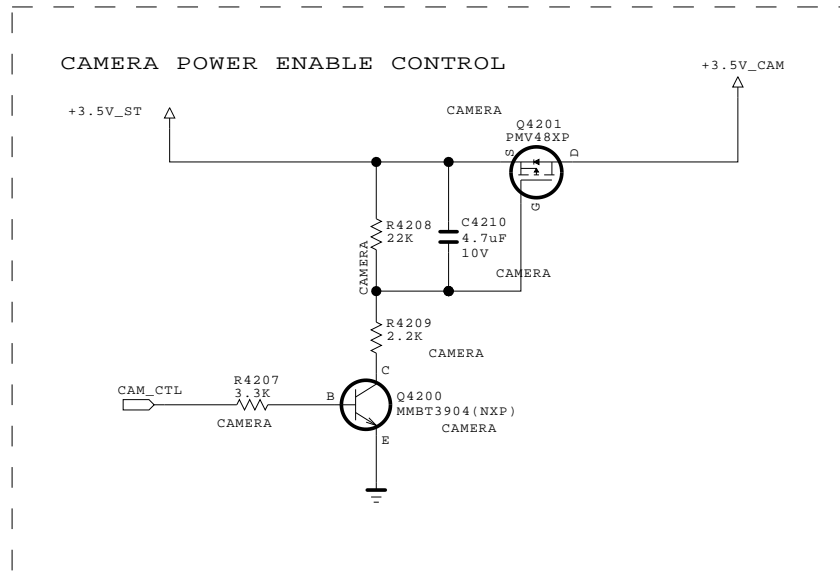
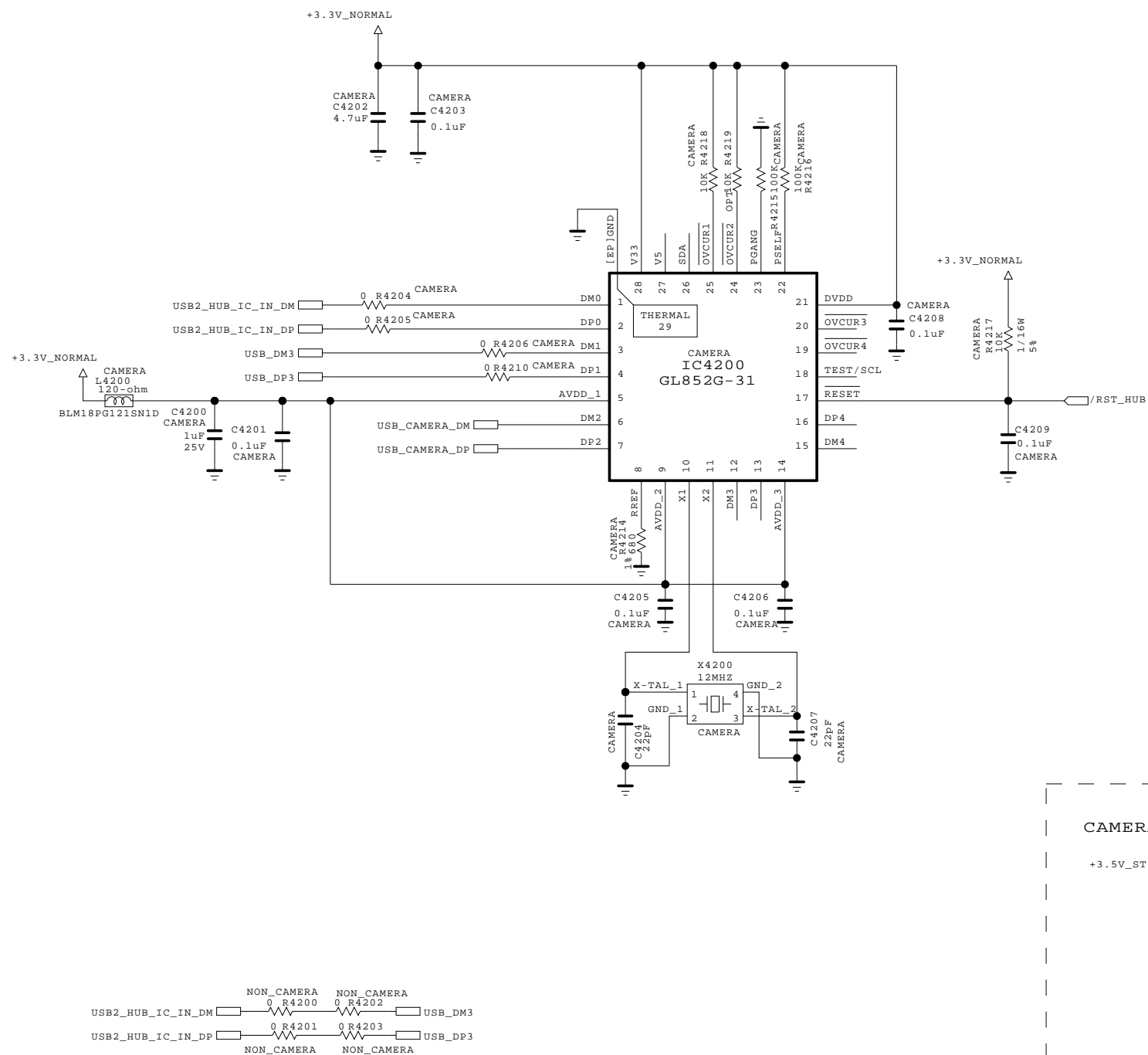
LG ELECTRONICS



MODEL	JACK HIGH/MID	DATE	2012.10.09
BLOCK		SHEET	/

BSD-NC4\_H034-HD



MODEL	IR / KEY	DATE	2012.10.10
BLOCK		SHEET	/



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

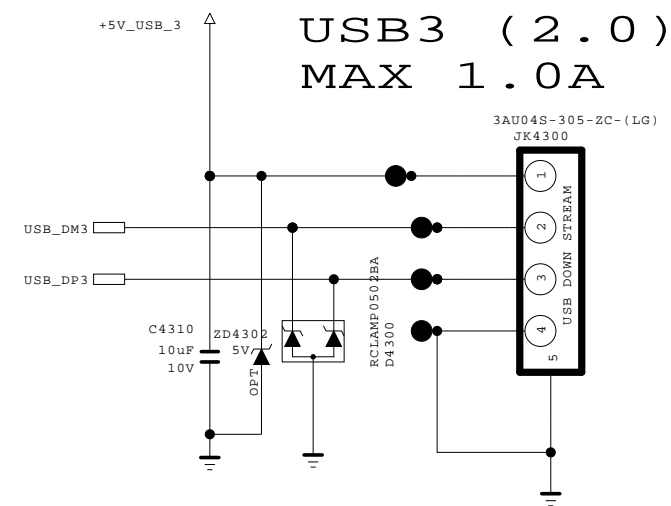
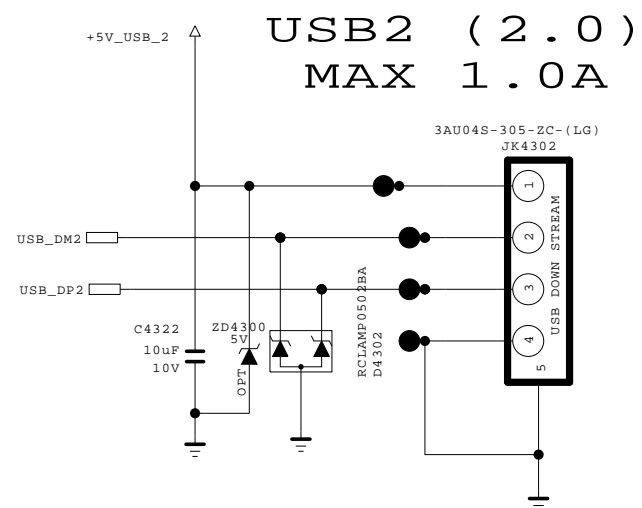
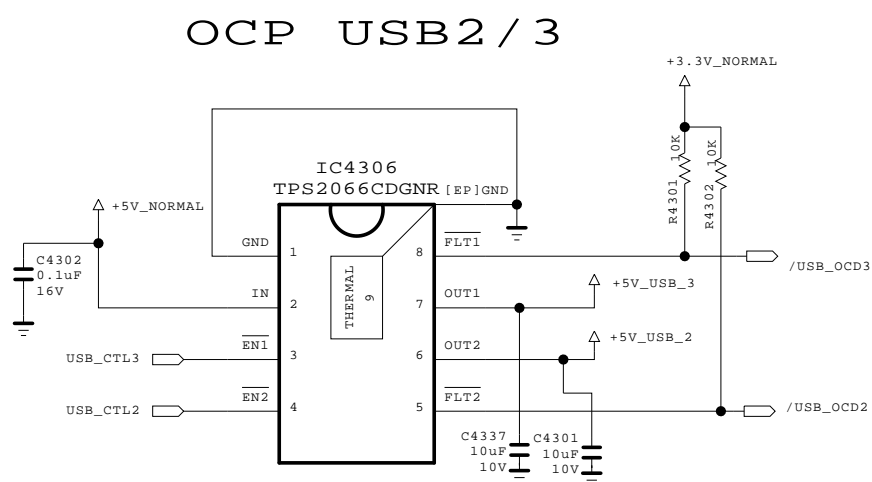
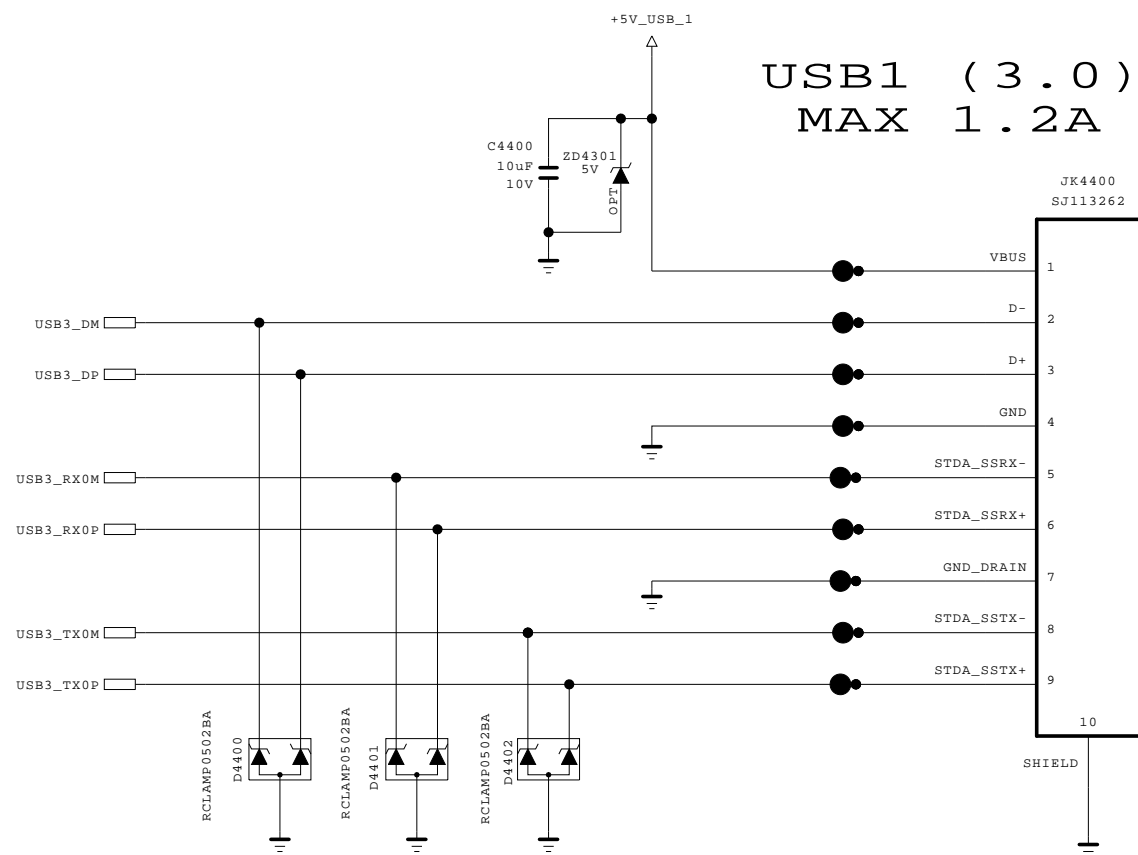
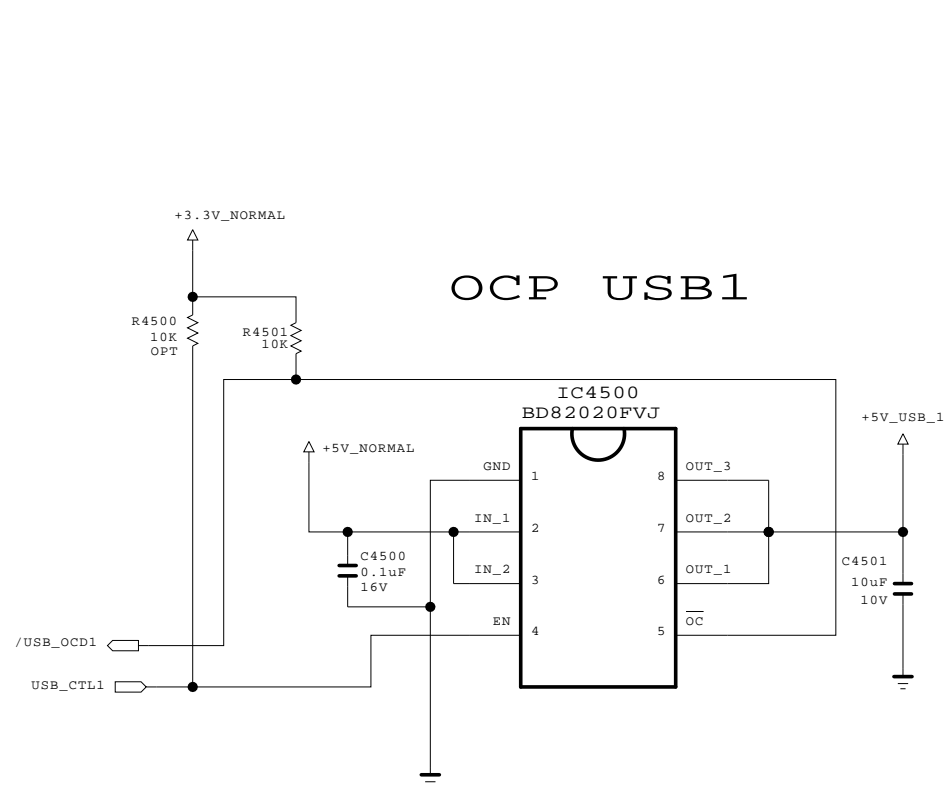
SECRET



LGElectronics



LG ELECTRONICS

BSD-NC4_H042-HD			
MODEL	USB3_HUB	DATE	2012.10.08
BLOCK		SHEET	/



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

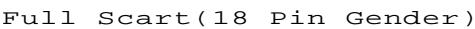
SECRET

LGElectronics

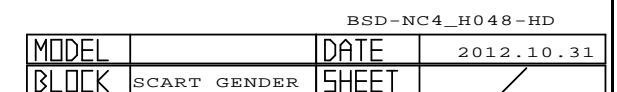
 LG ELECTRONICS

BSD-NC4_H044-HD			
MODEL		DATE	2012-11-09
BLOCK	USB JACK	SHEET	/

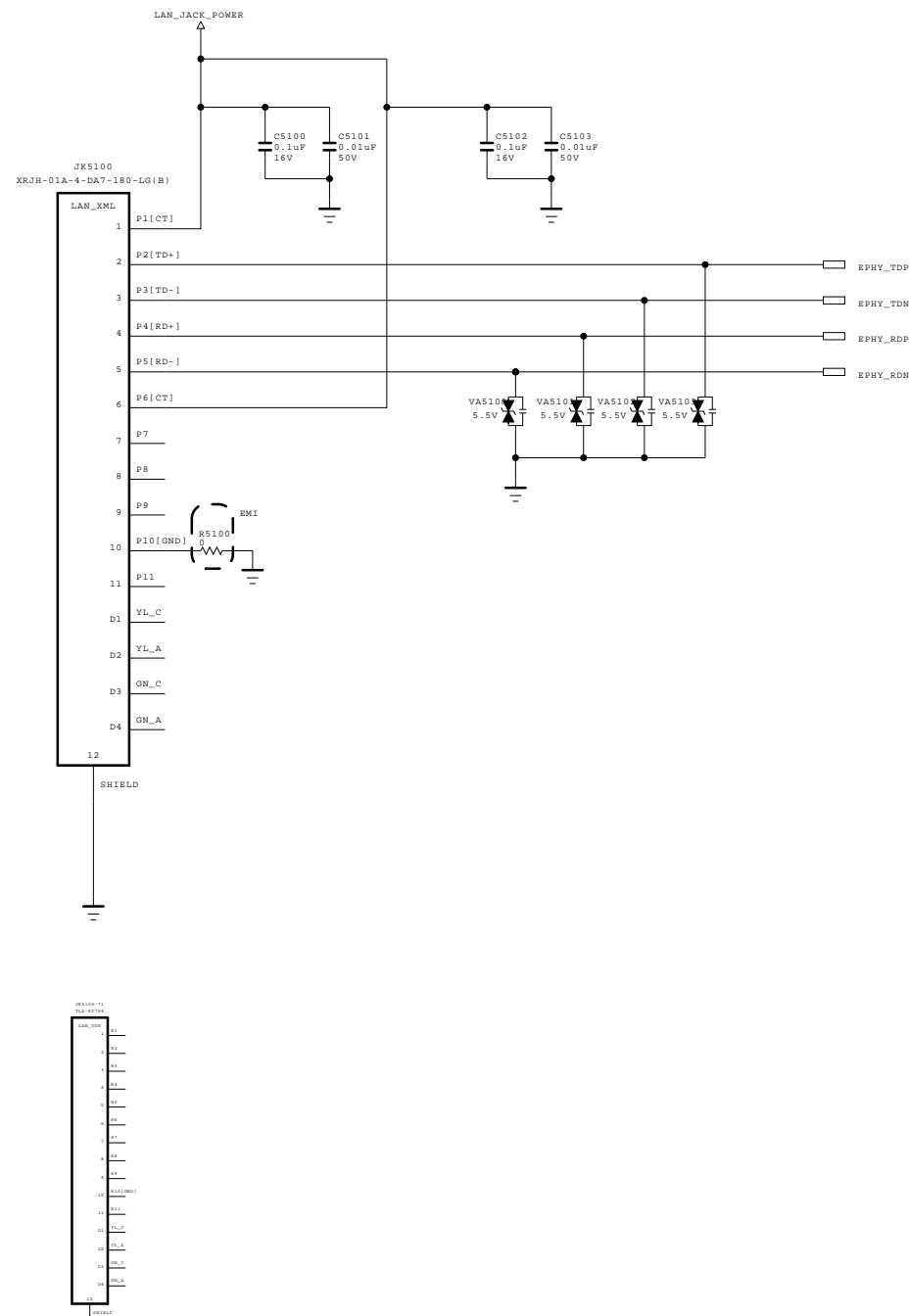






SECRET  
LGElectronics



## Ethernet Block



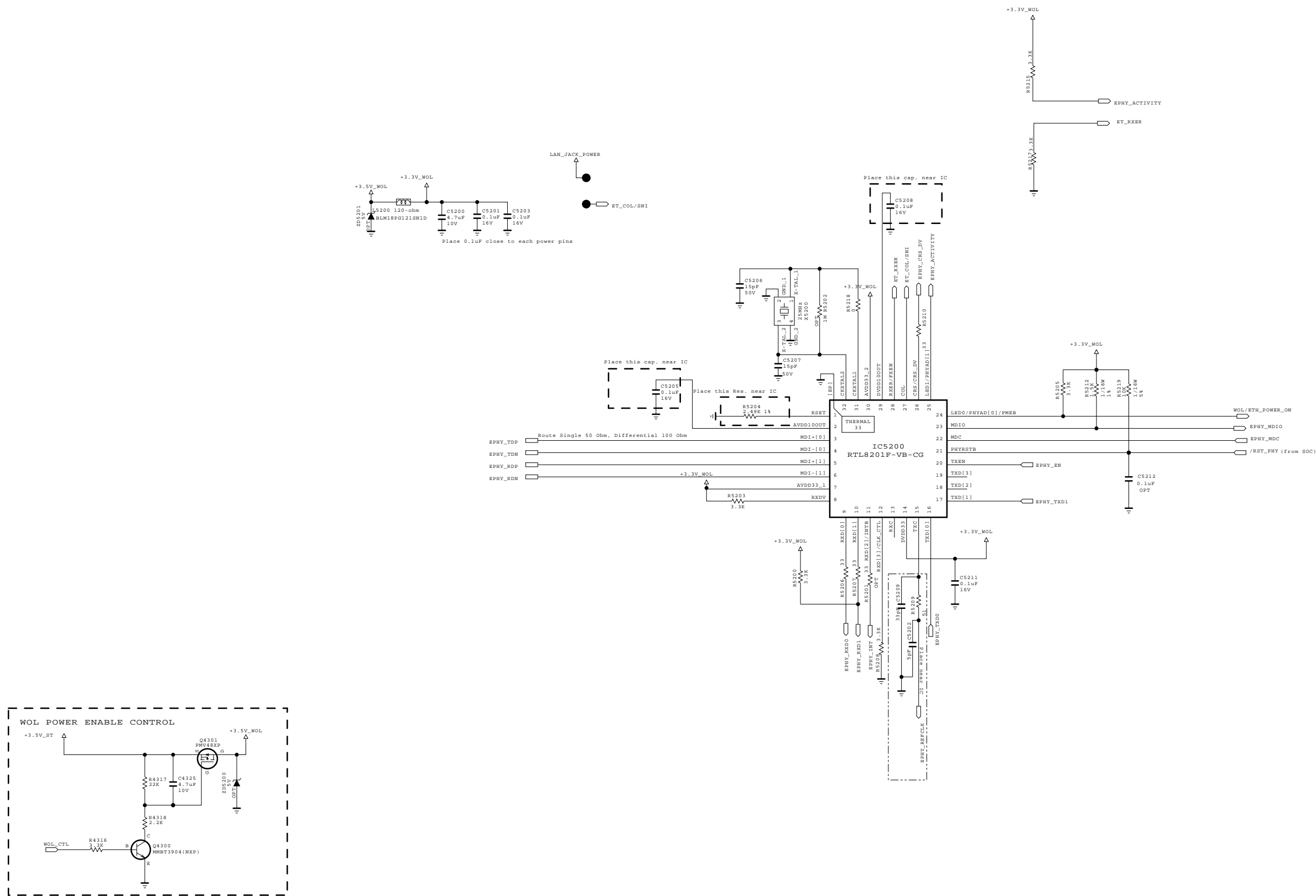
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.



SECRET  
LGElectronics



MODEL	LAN_VERTICAL	DATE	2011.12.09
FIG. NO.		SHEET	50 /

# Ethernet Block



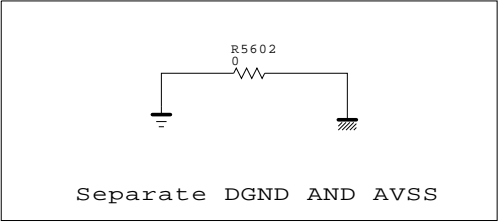
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SECRET  
LGElectronics

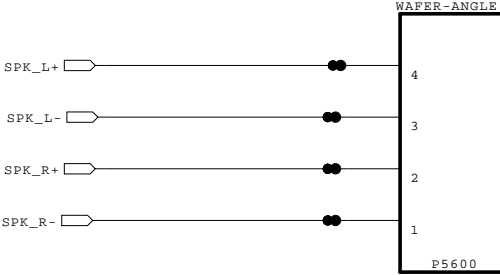
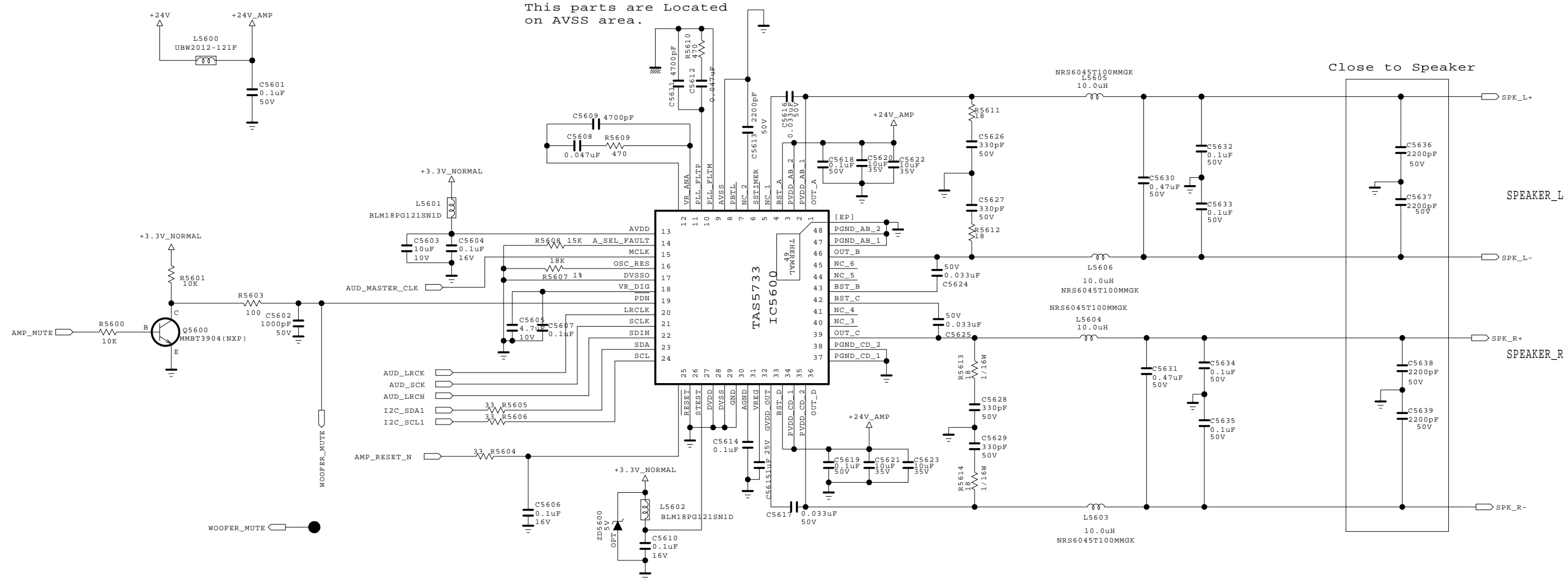




BSD-NC4\_H052-HD


MODEL		DATE	2012-09-12
BLOCK	ETHERNET	SHEET	/



This parts are Located on AVSS area.

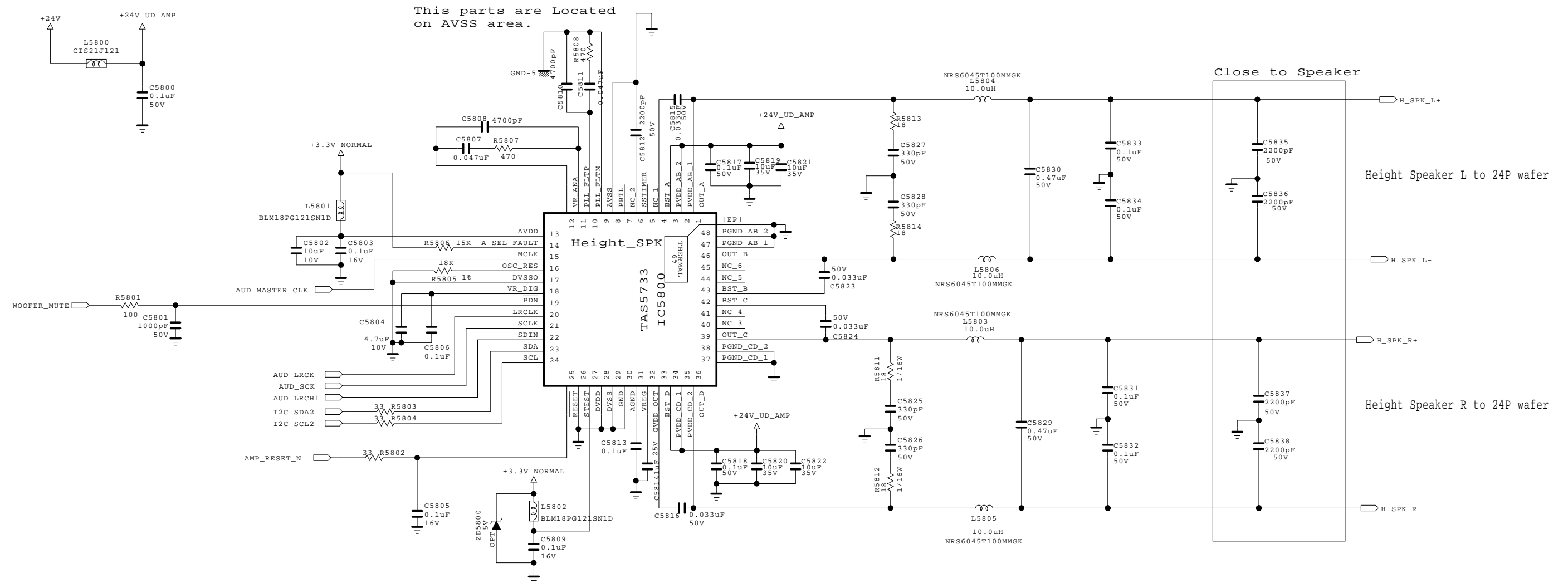
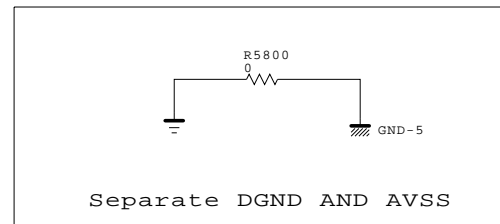


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SECRET	LG Electronics	 LG ELECTRONICS	MODEL	GP4_MT5369	DATE	2011.11.21
			BLOCK	AUDIO[ST]	SHEET	58 /



# Height\_SPK option

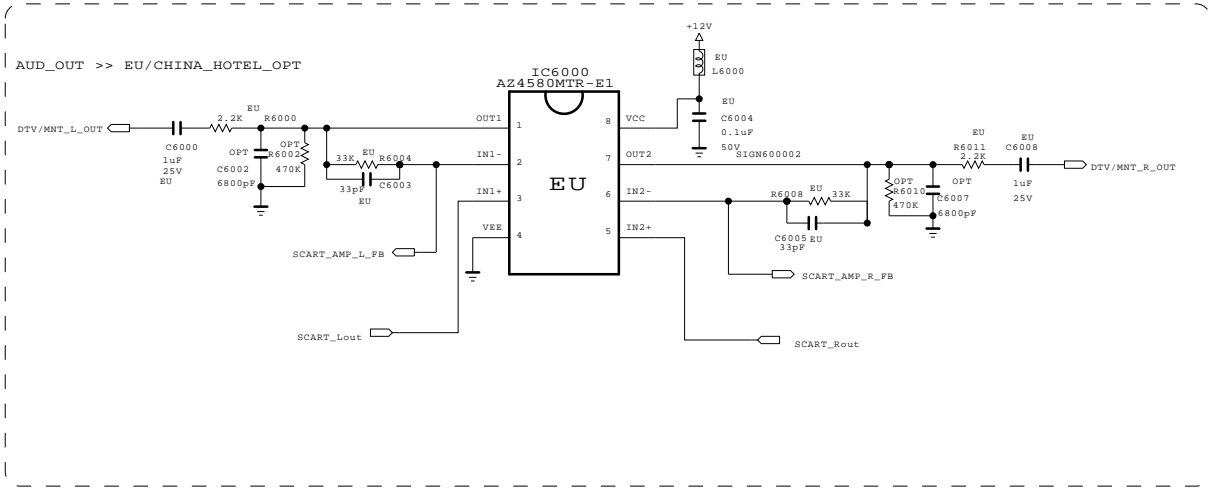


THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.

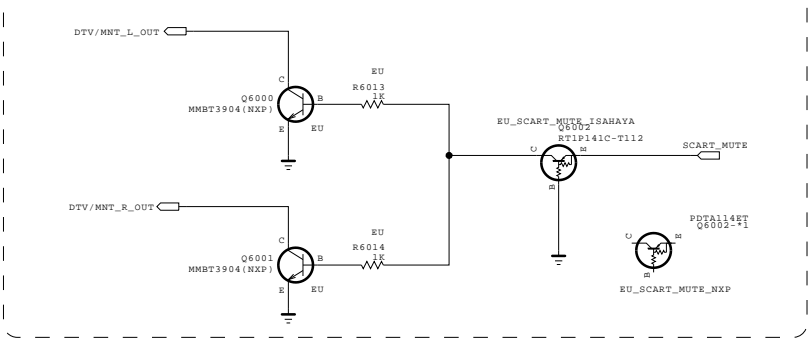
SECRET  
LGElectronics





MODEL	H13_UD	DATE	
BLOCK	AUDIO[HEIGHT CH.]	SHEET	58 /



[ SCART AUDIO MUTE ]



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

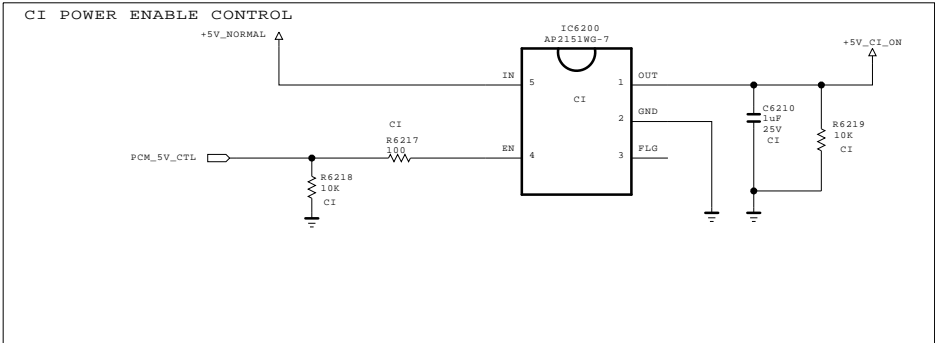
SECRET  
LGElectronics





MODEL	SCART AUDIO AMP	DATE	2011.11.21
BLOCK		SHEET	60 /







THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET

LGElectronics



LG ELECTRONICS

MODEL

CI SLOT

DATE

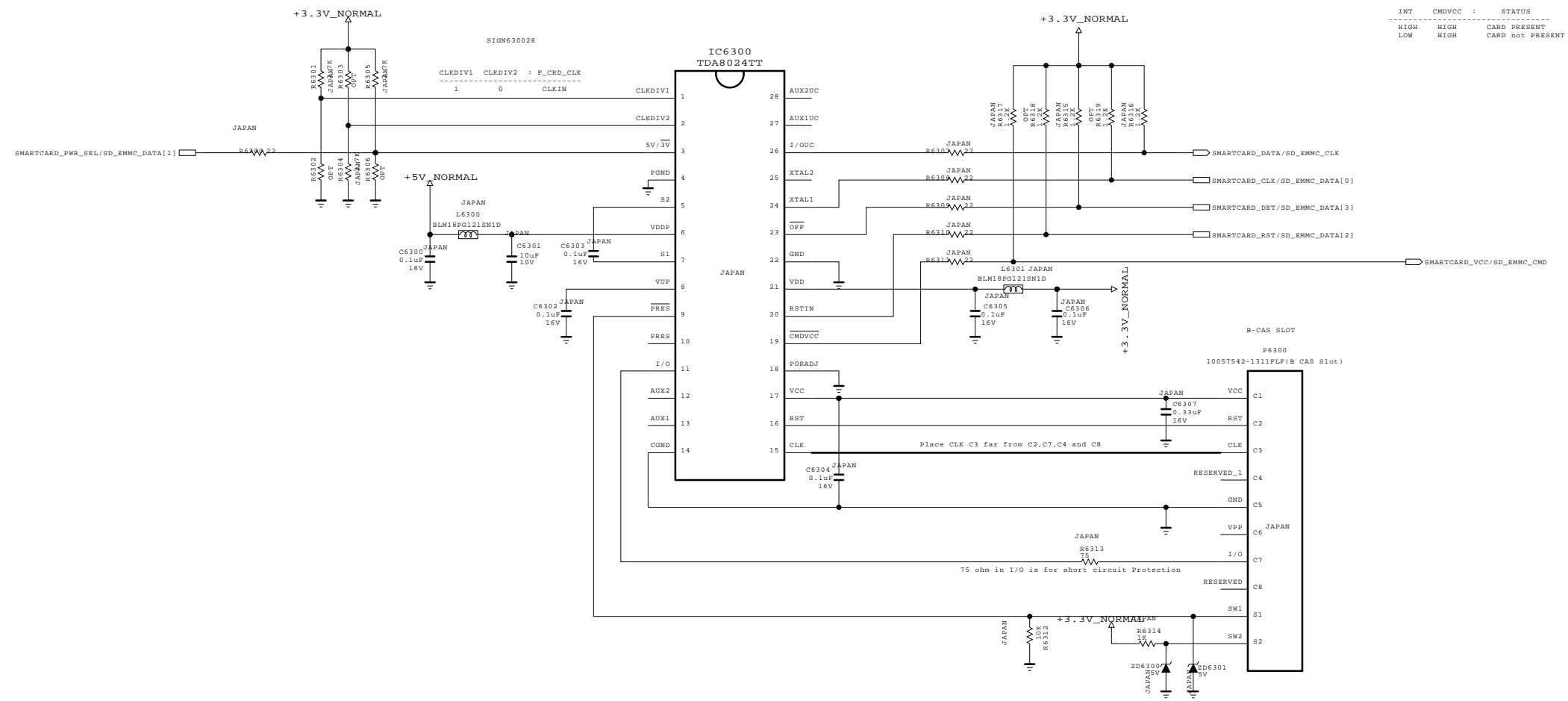
2011.10.31



BLOCK

SHEET

62

B-CAS (SMART CARD) INTERFACE

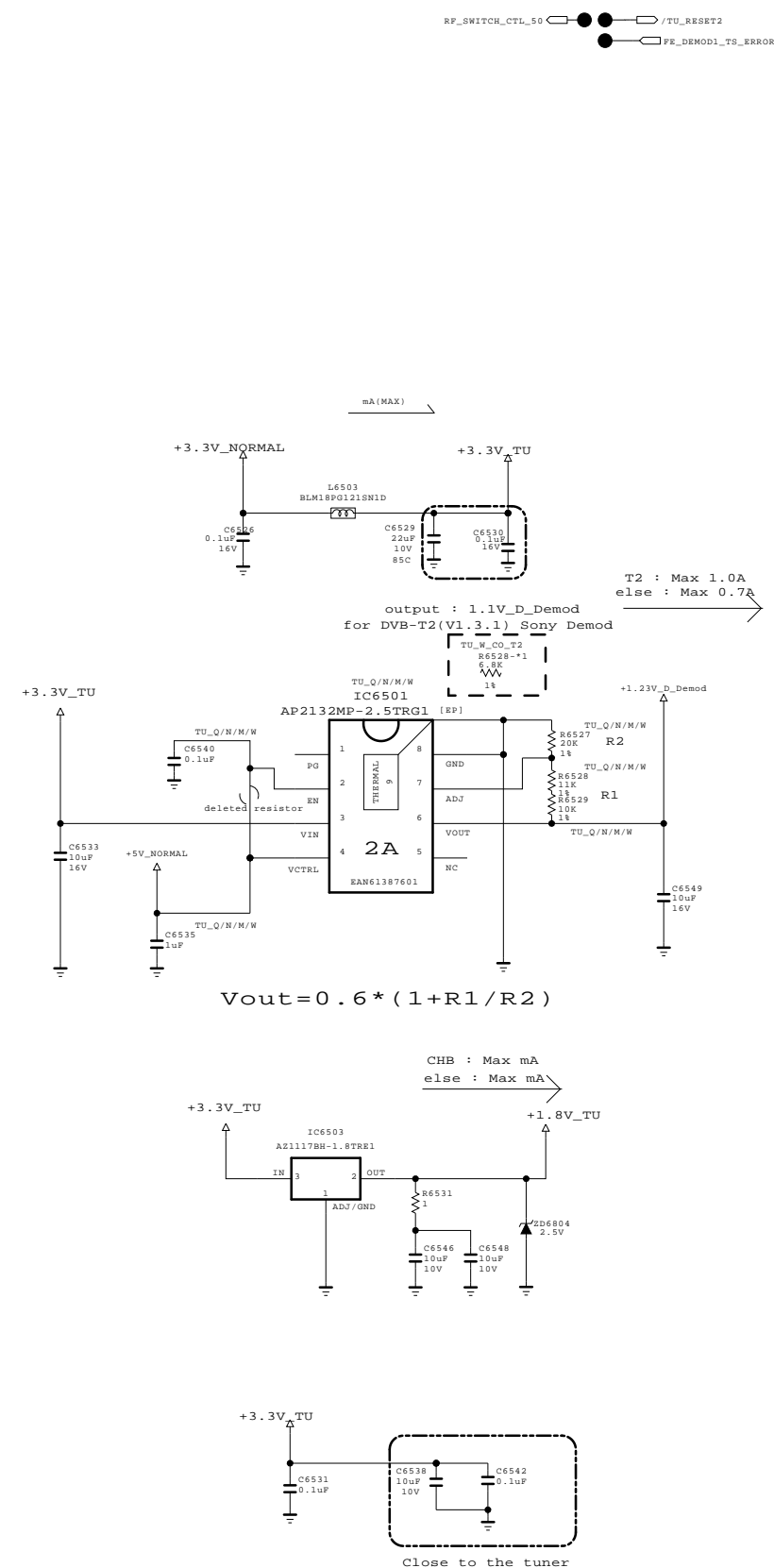


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SECRET  
LGElectronics



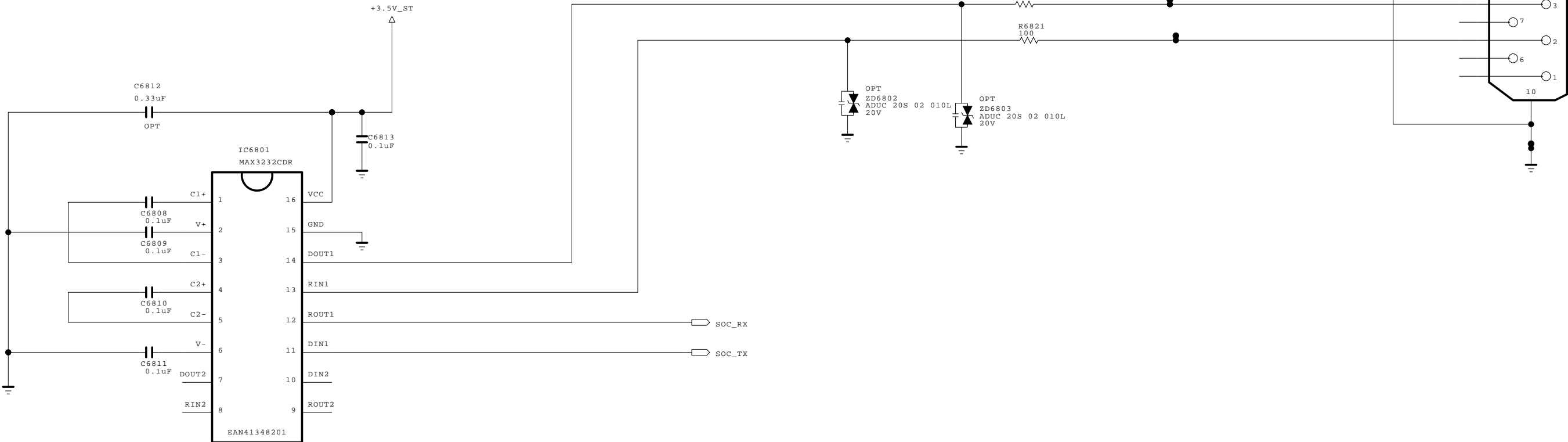
MODEL	CI SLOT	DATE	2011.04.17
BLOCK		SHEET	62 /





MODEL	TUNER	DATE	2012.07.10
BLOCK		SHEET	65 /



# RS-232C Control INTERFACE



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET

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LG Electronics



MODEL		DATE	12/08/16
BLOCK	RS232C	SHEET	68 /

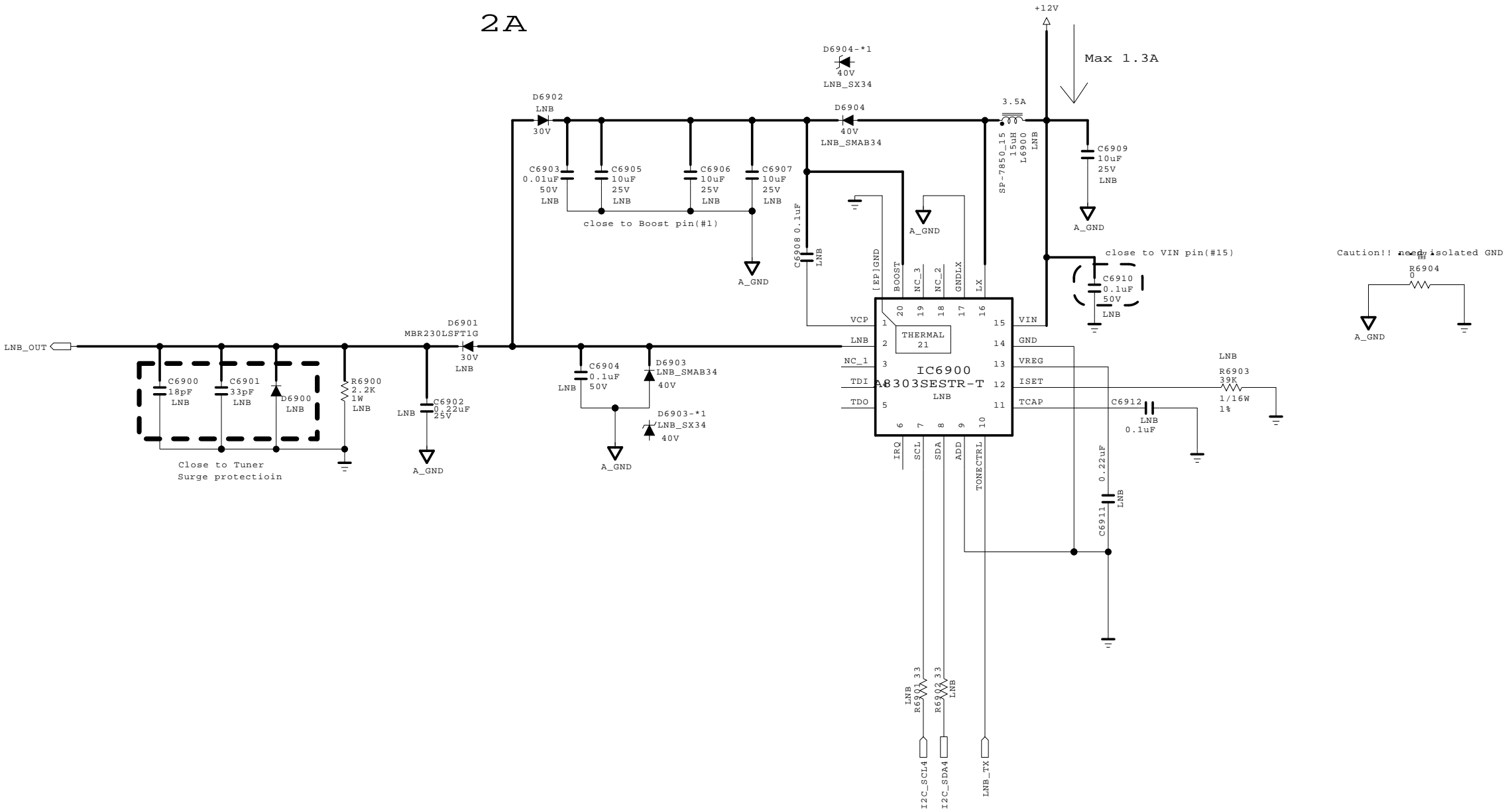
DVB-S2 LNB Part Allegro



(Option:LNB)

3A

Input trace widths should be sized to conduct at least 3A  
Ouput trace widths should be sized to conduct at least 2A

2A



THE  SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMETIC.

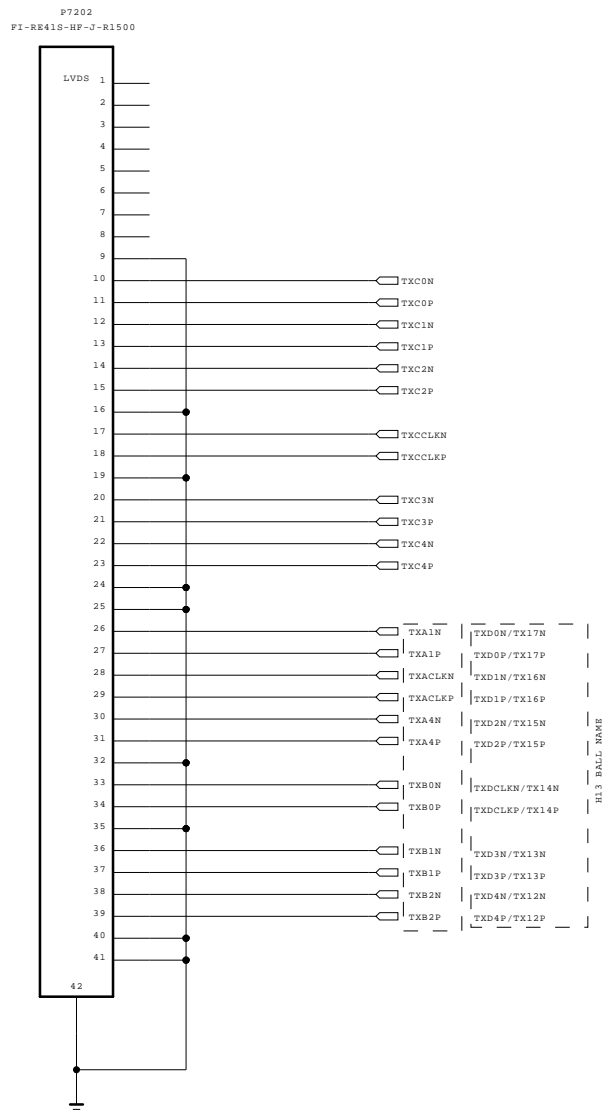
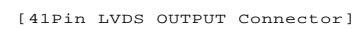
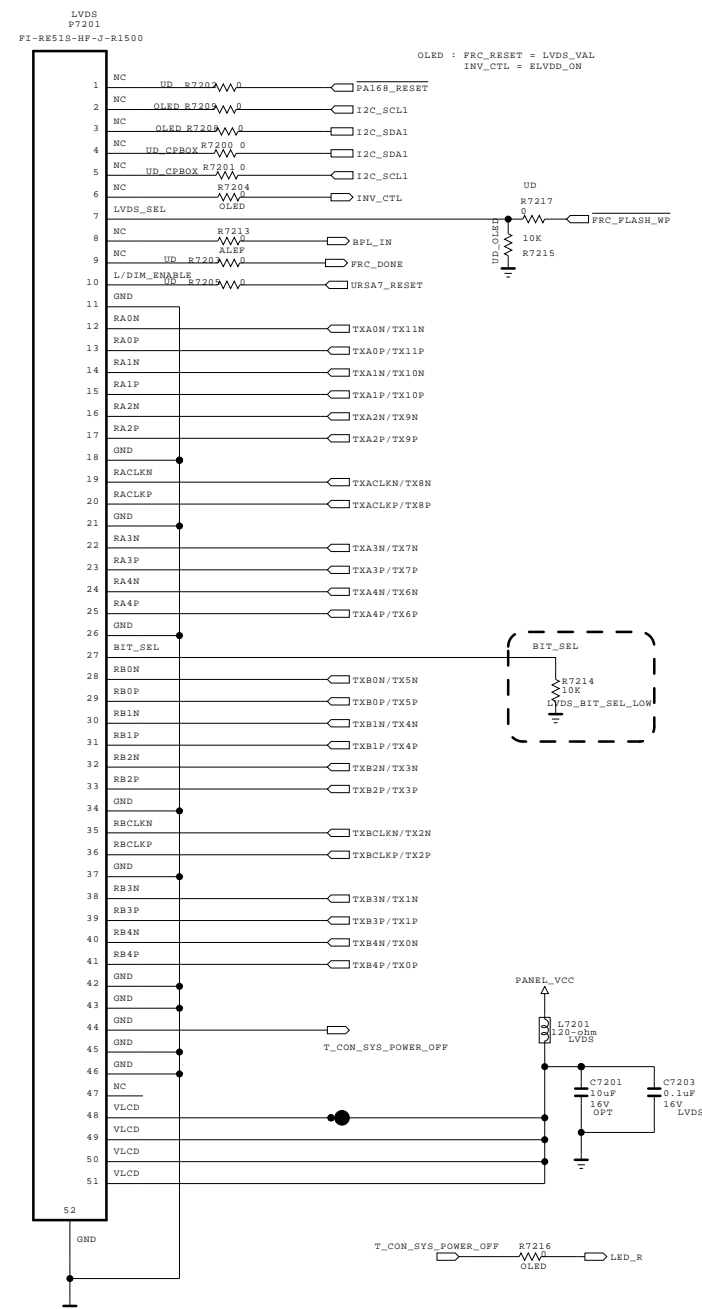
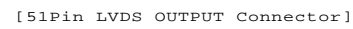
SECRET

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 LG ELECTRONICS

MODEL	LNB	DATE	2012.03.08
BLOCK		SHEET	69 /

## LVDS



THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.

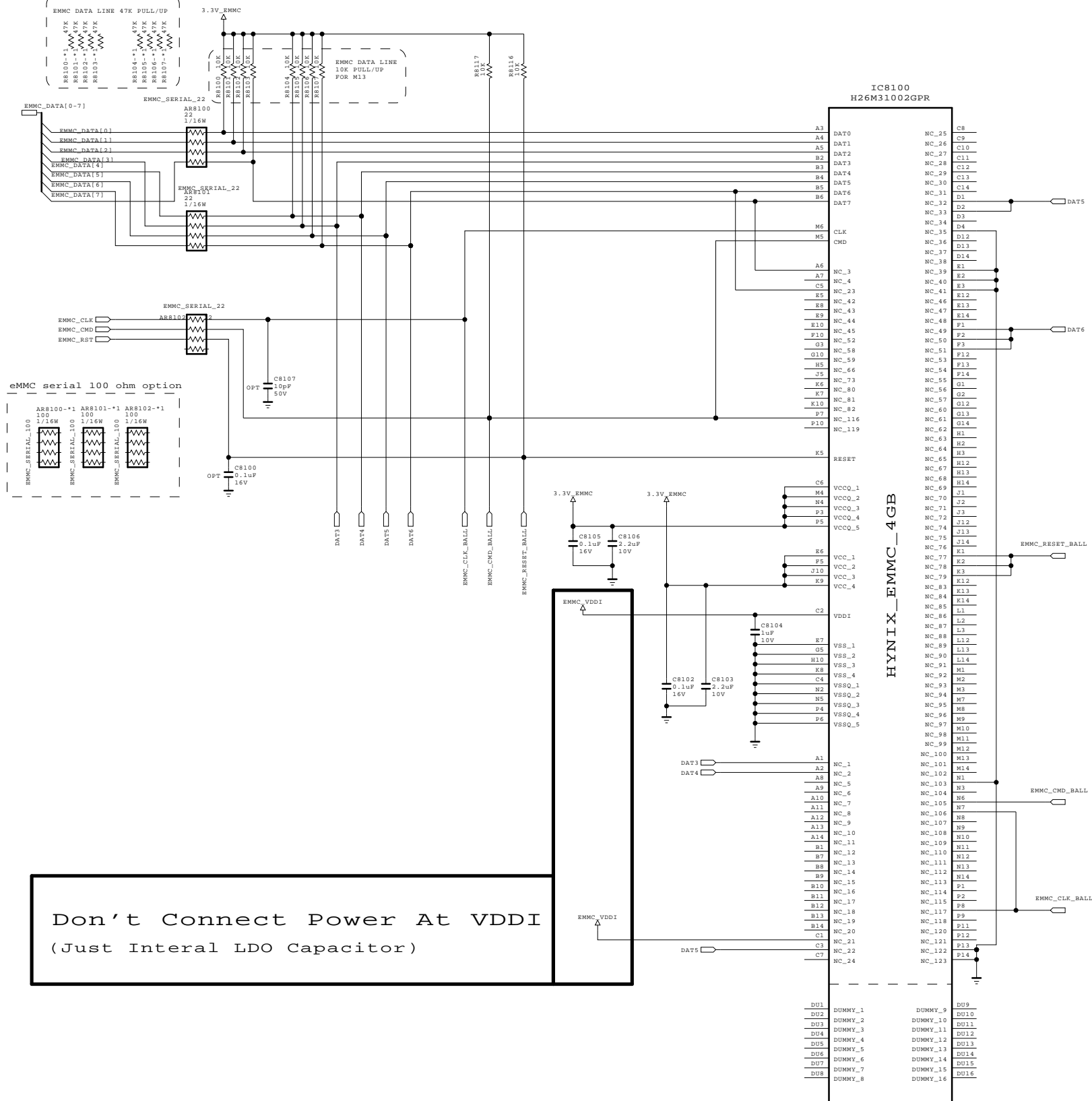
SECRET  
LGElectronics



BSD-NC4\_H072-HD

MODEL		DATE	2012-10-15
BLOCK	LVDS INTERFACE	SHEET	/

## eMMC I/F



THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.

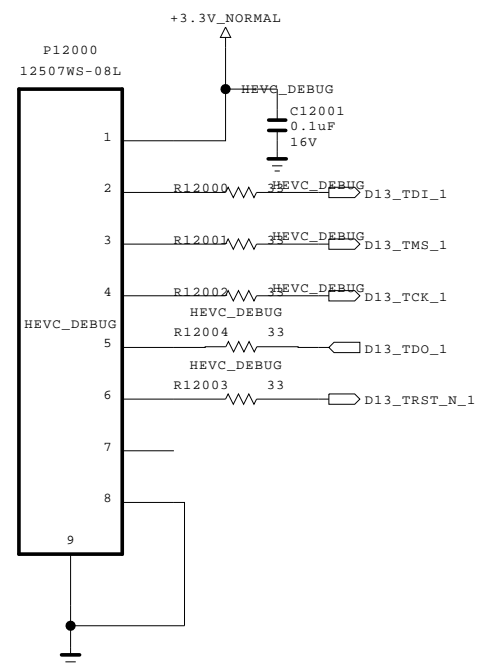
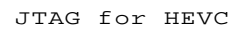
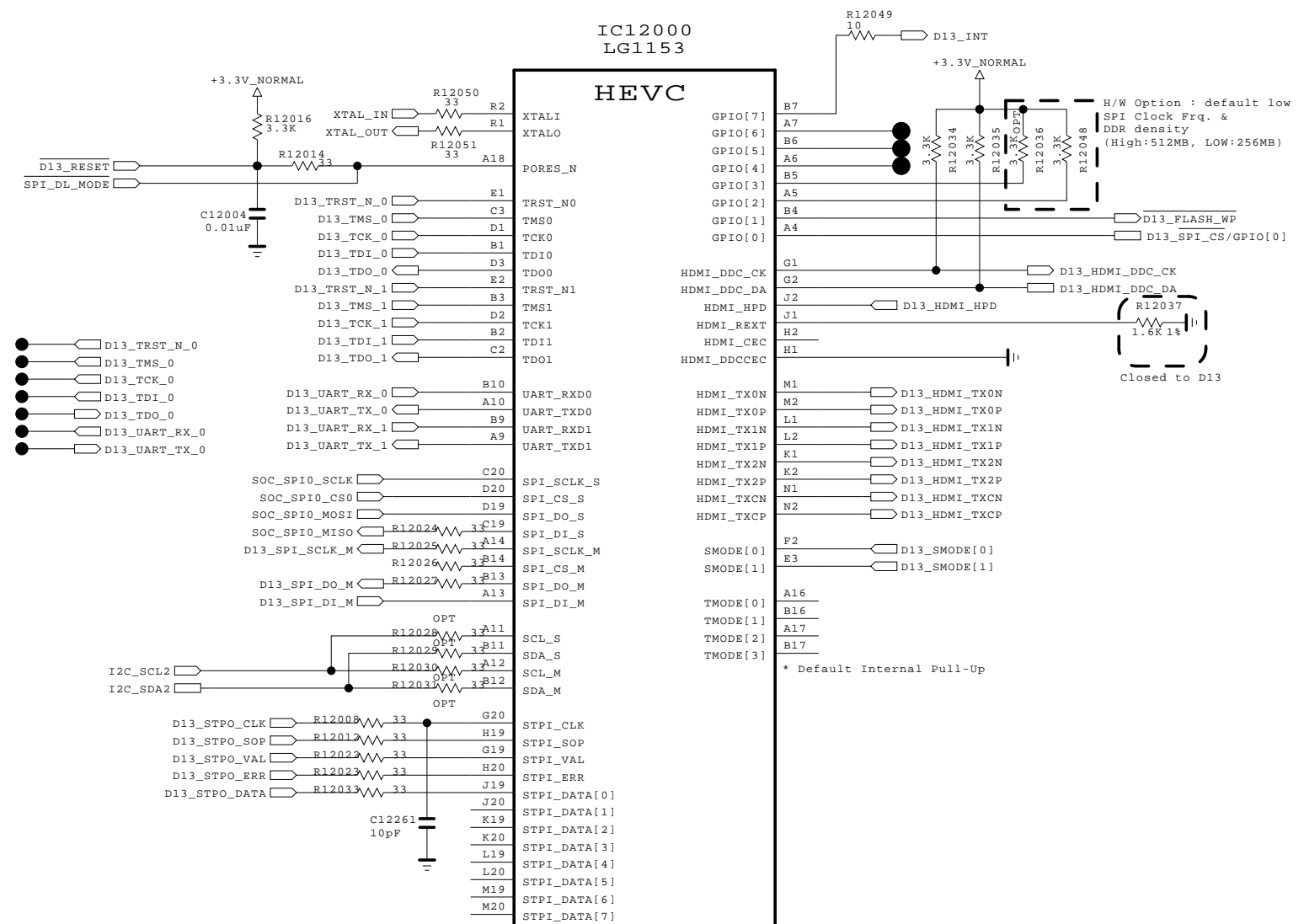
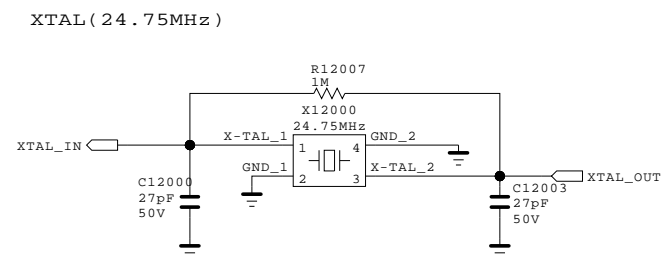
SECRET  
LGElectronics

LG ELECTRONICS

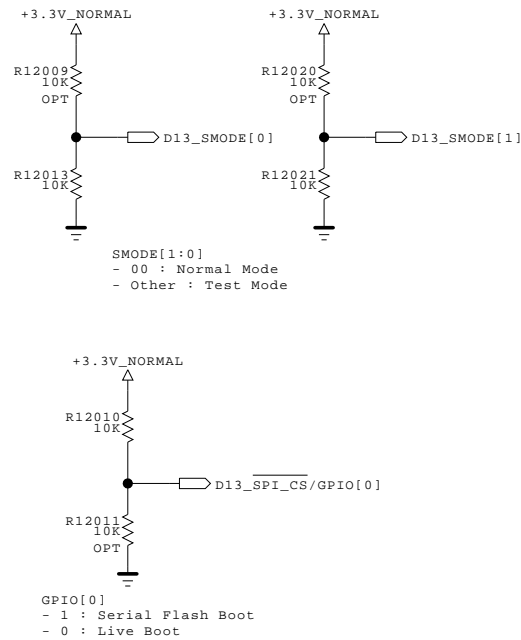
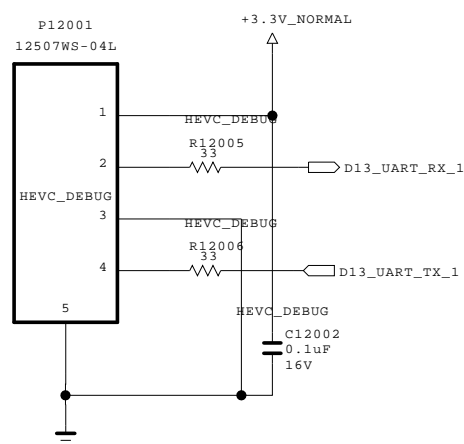
MODEL	eMMC	DATE	11.09.29
BLOCK		SHEET	81



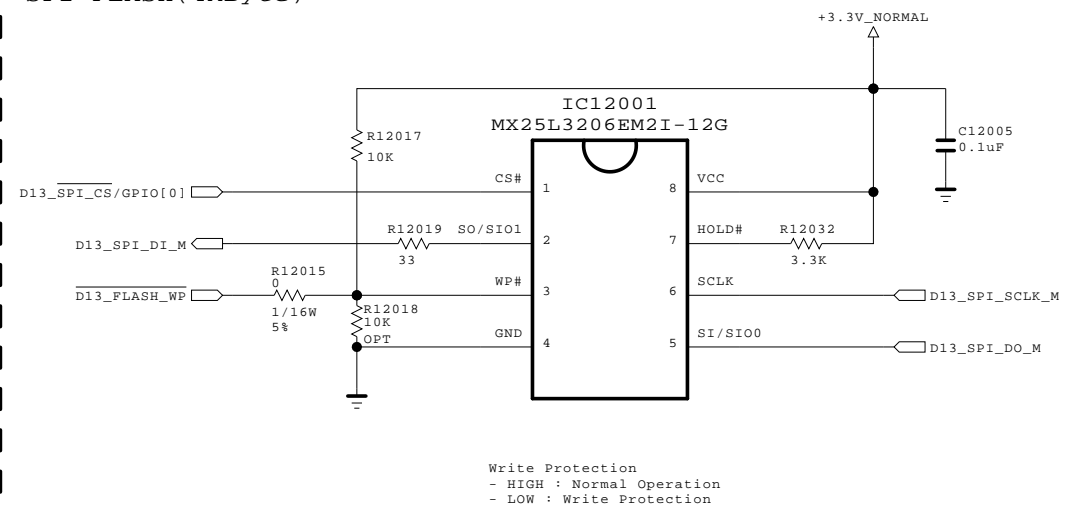
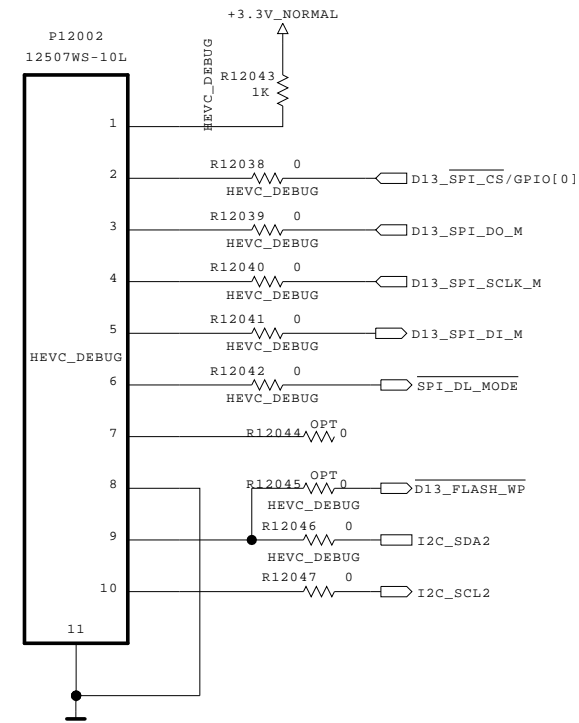
# HEVC option sheet



UART For HEVC



Serial Flash Boot Test



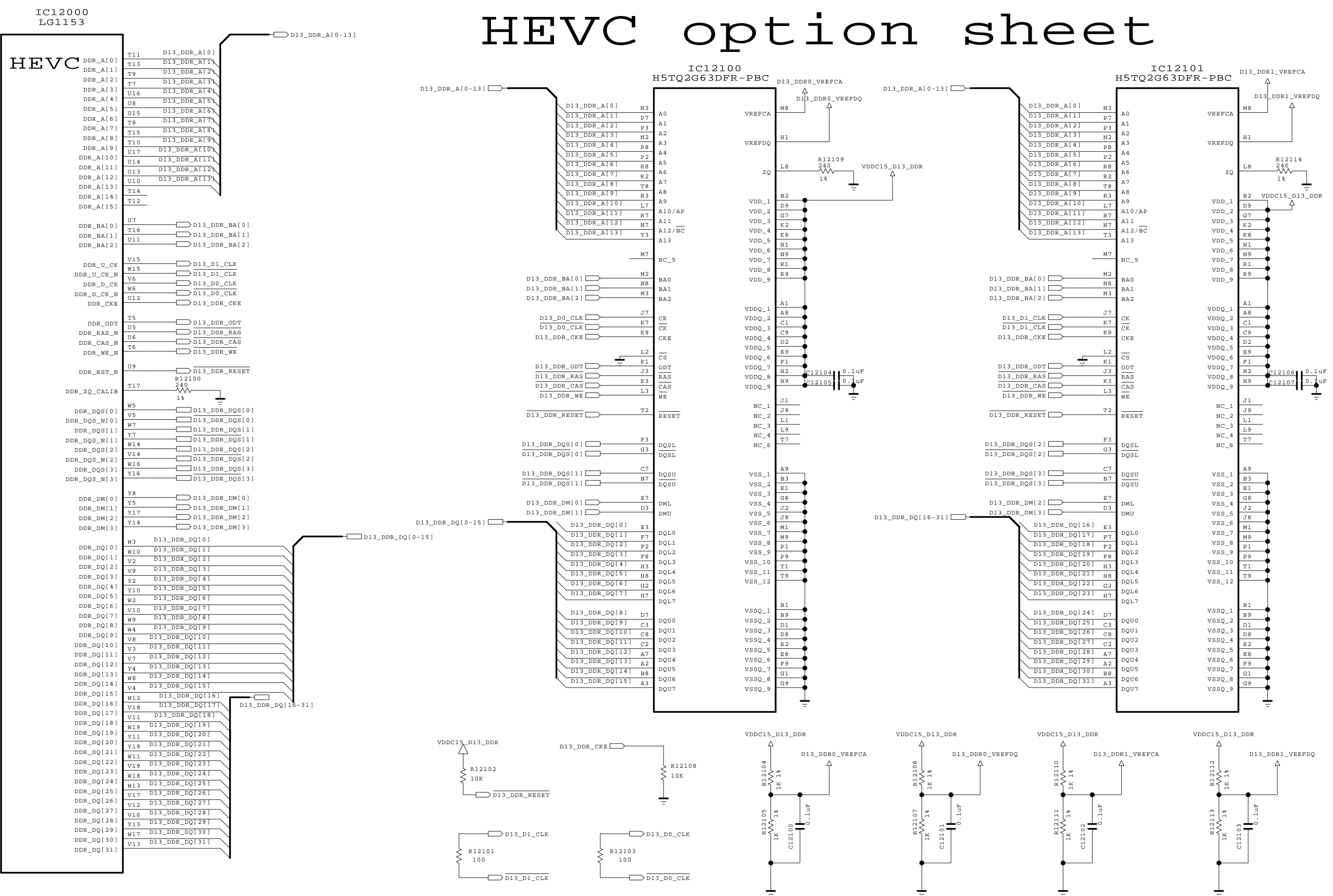
THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.

SECRET  
LGElectronics



MODEL		DATE	
BLOCK		SHEET	/

# HEVC option sheet



THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.

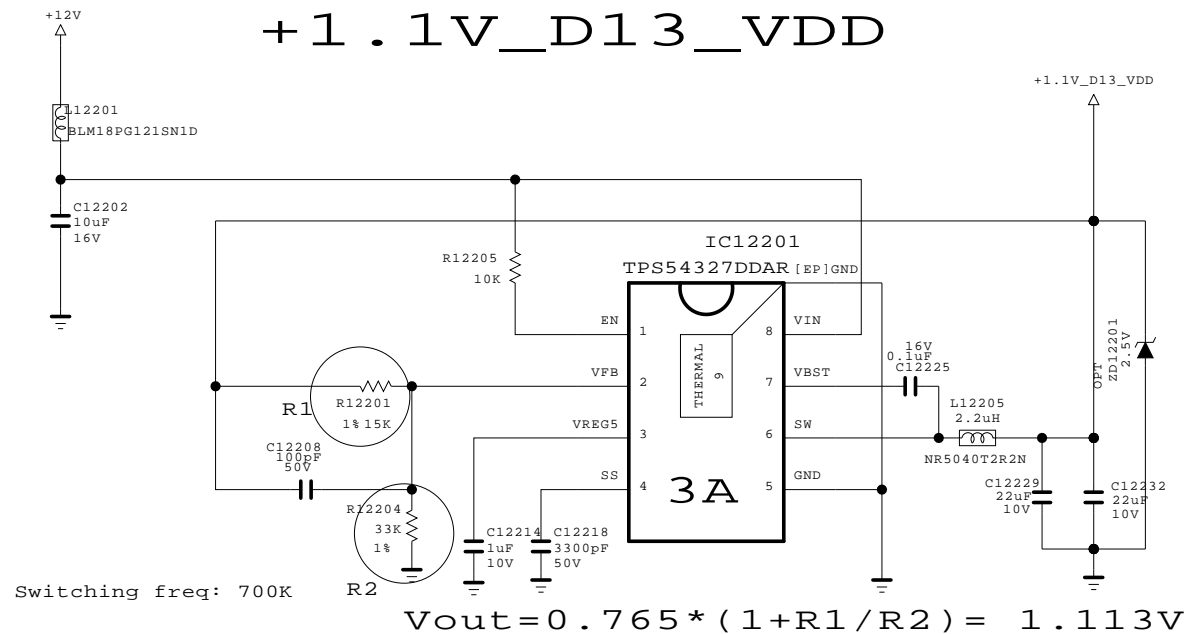
SECRET  
LGElectronics



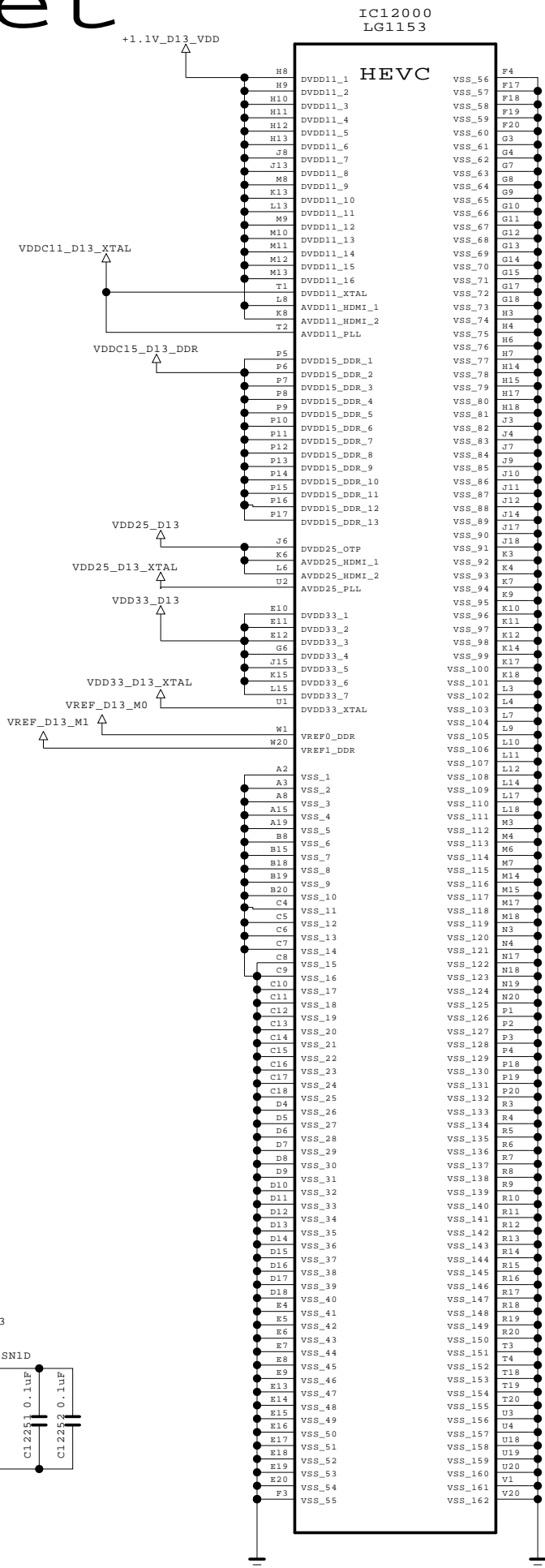
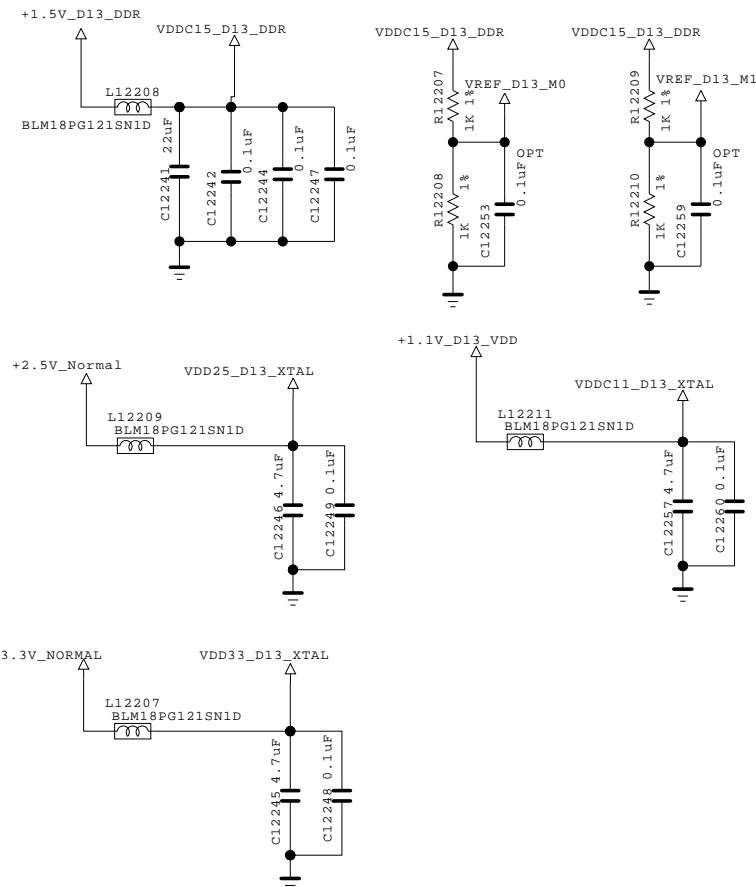
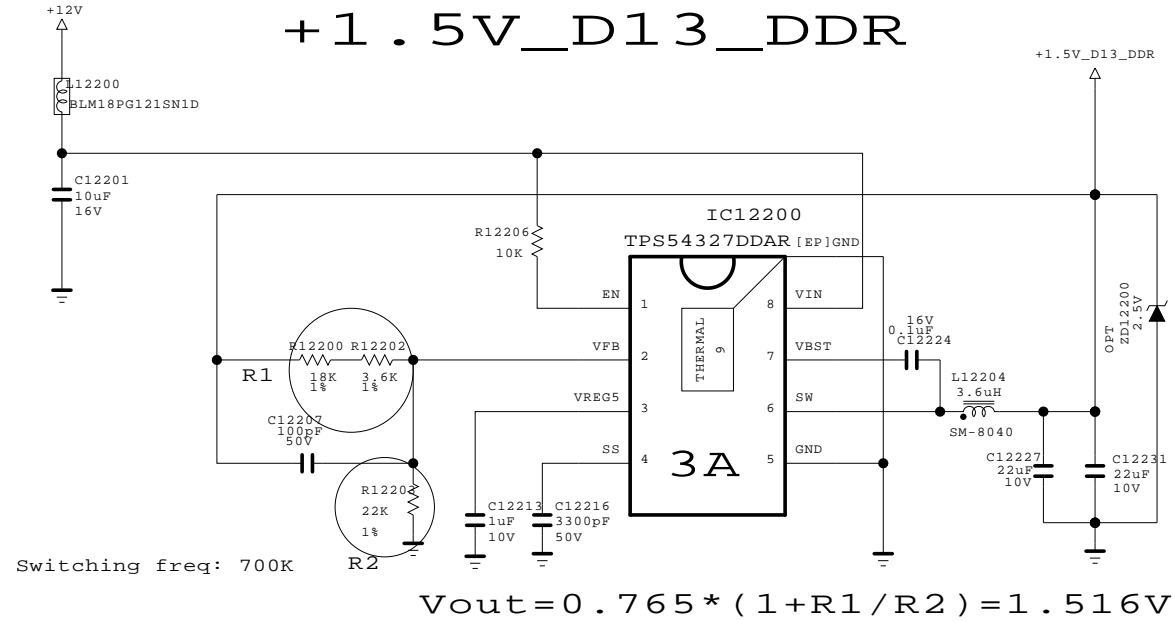
MODEL		DATE	
BLOCK		SHEET	



# HEVC option sheet

## +1.1V\_D13\_VDD



## +1.5V\_D13\_DDR



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

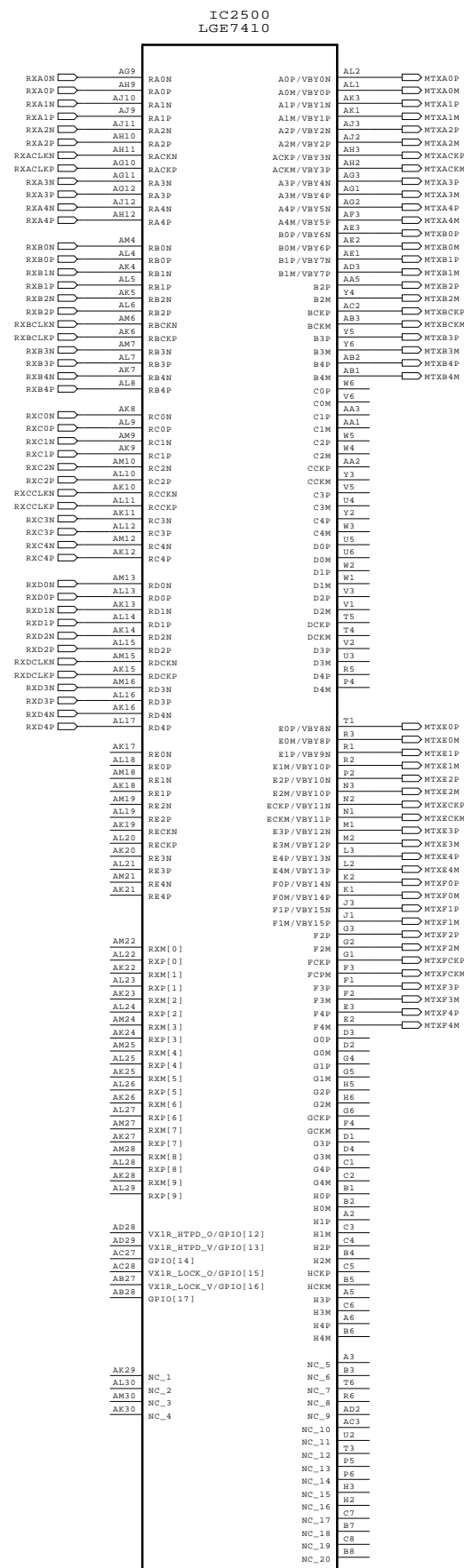
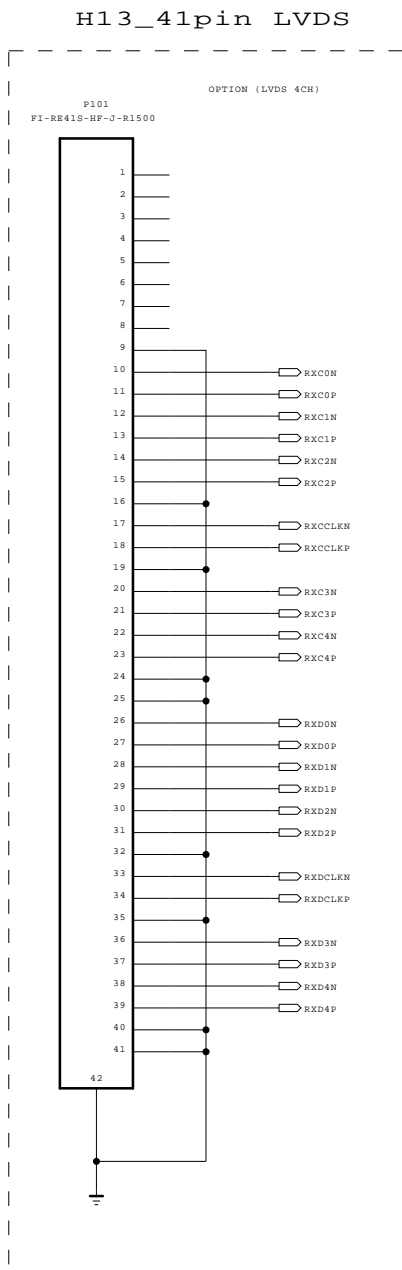
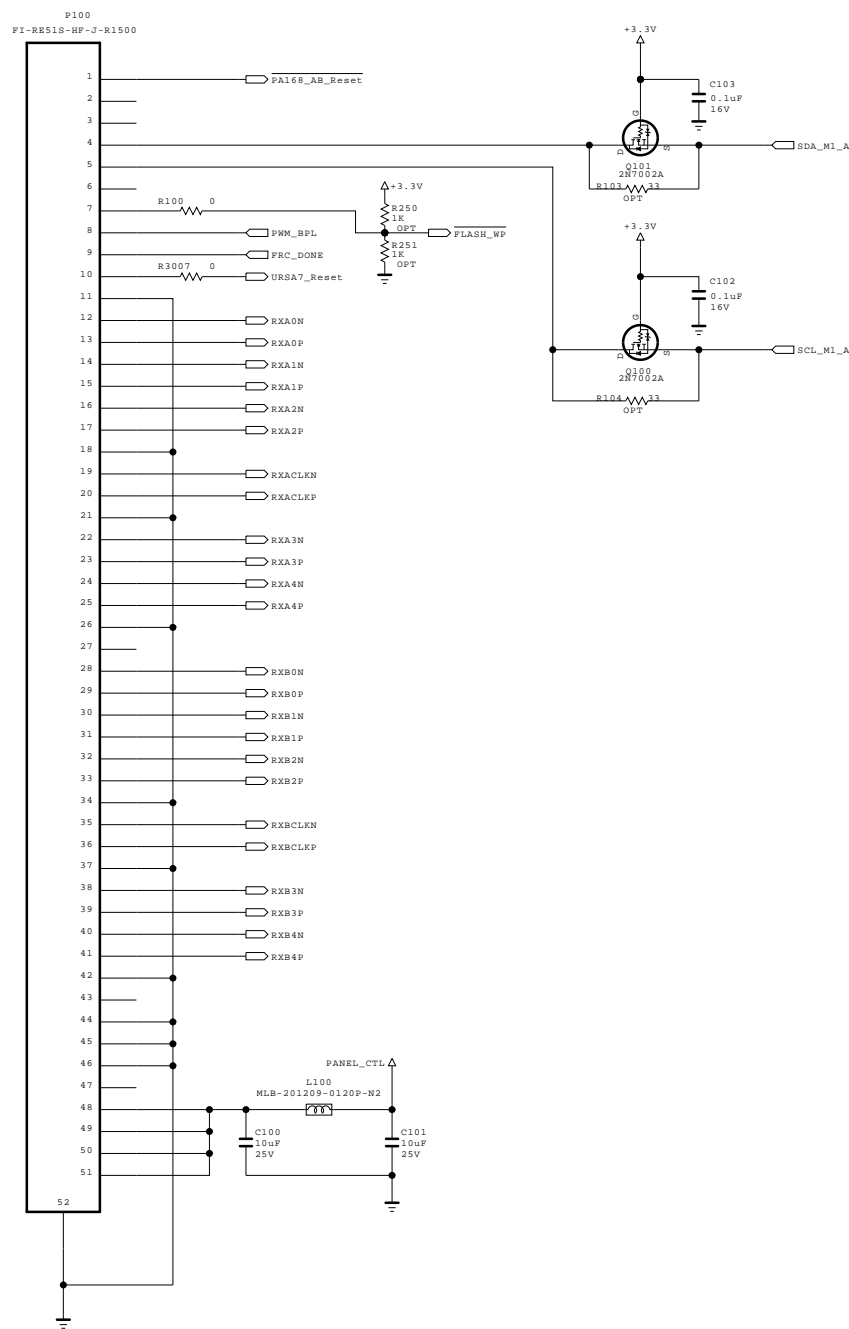
SECRET  
LGElectronics



 LG ELECTRONICS

MODEL		DATE	
BLOCK		SHEET	/

[ 51P HS-LVDS input wafer ]

[ 41P HS-LVDS input wafer ]



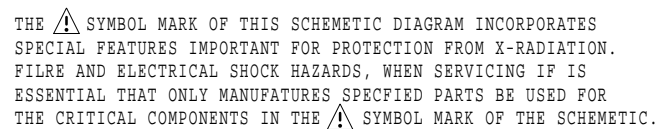
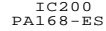
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET  
LGElectronics



MODEL	EAX65309301	DATE	2013.03.18
BLOCK	U_LVDS INPUT	SHEET	2 / 22

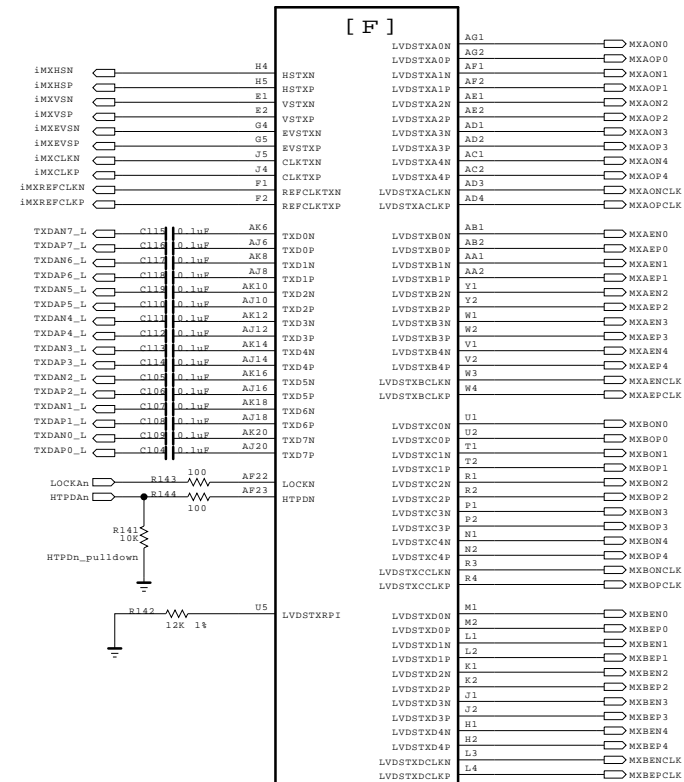
IC100  
PA168-ES



SECRET  
LGElectronics



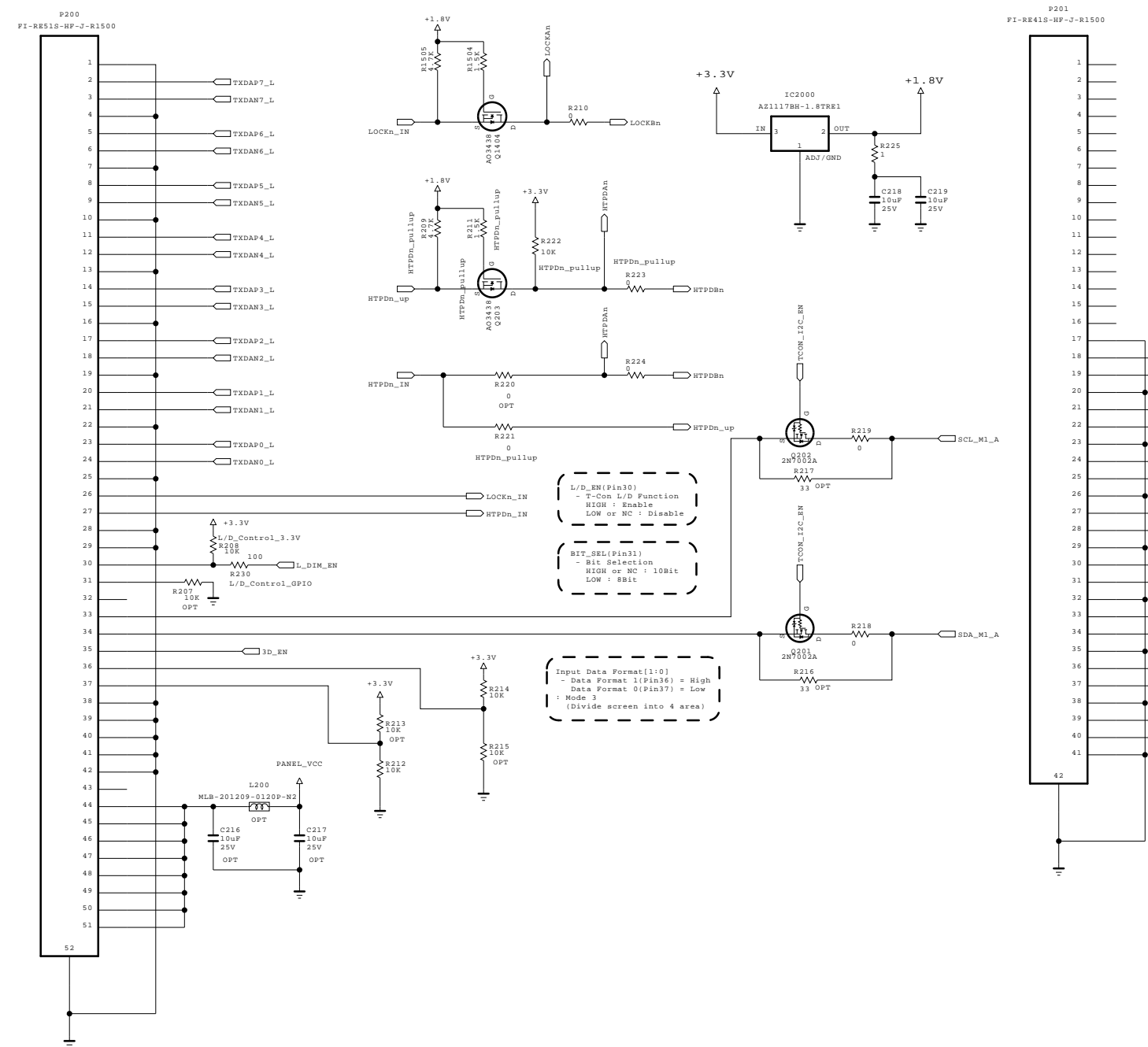
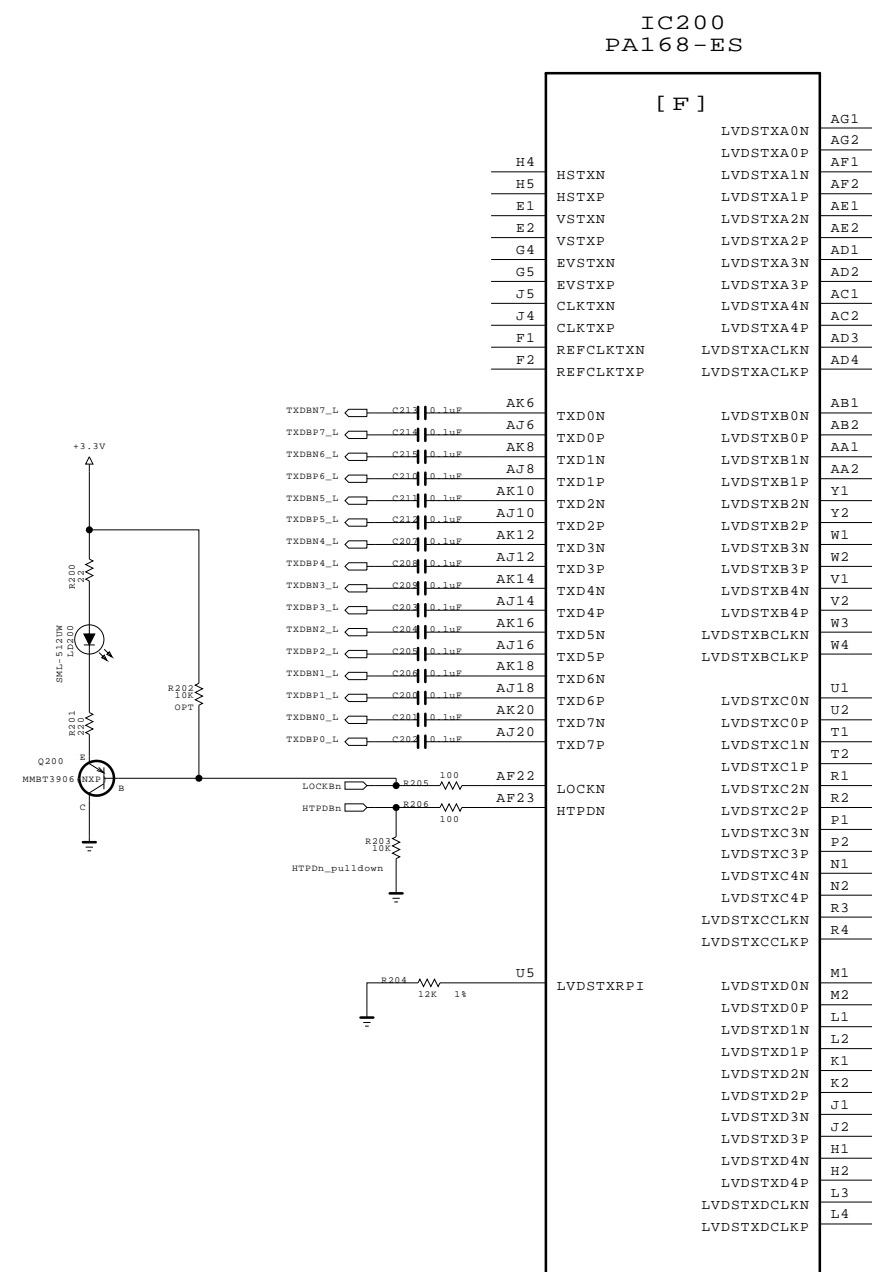
IC100  
PA168-ES



MODEL	EAX65309301	DATE	2013.03.18
BLOCK	P_LVDS INPUT	SHEET	3 / 22

[51P Vx1 output wafer]

[ 41P Vx1 output wafer ]

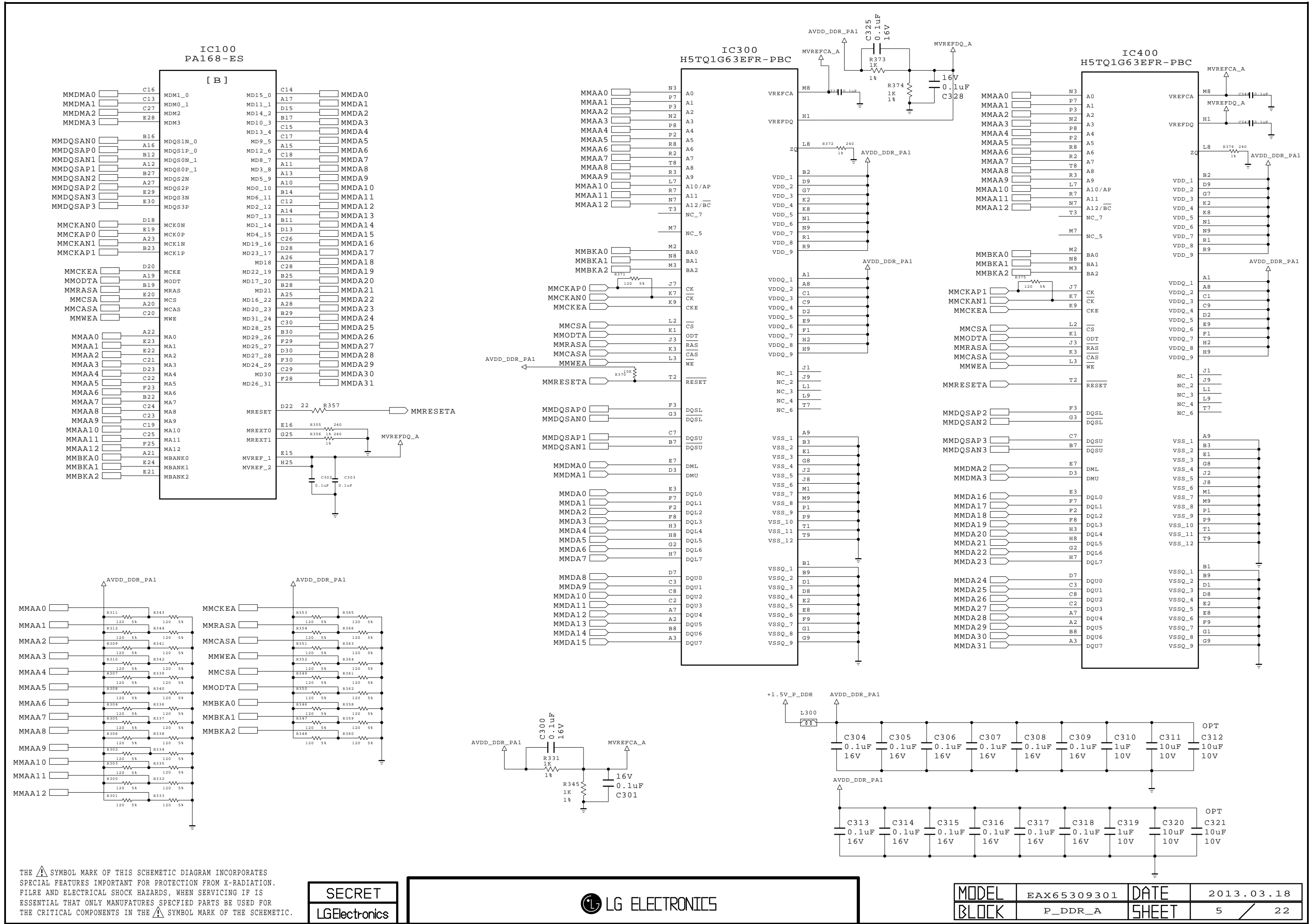


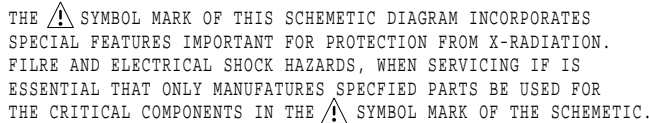
THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.

SECRET  
LG Electronics



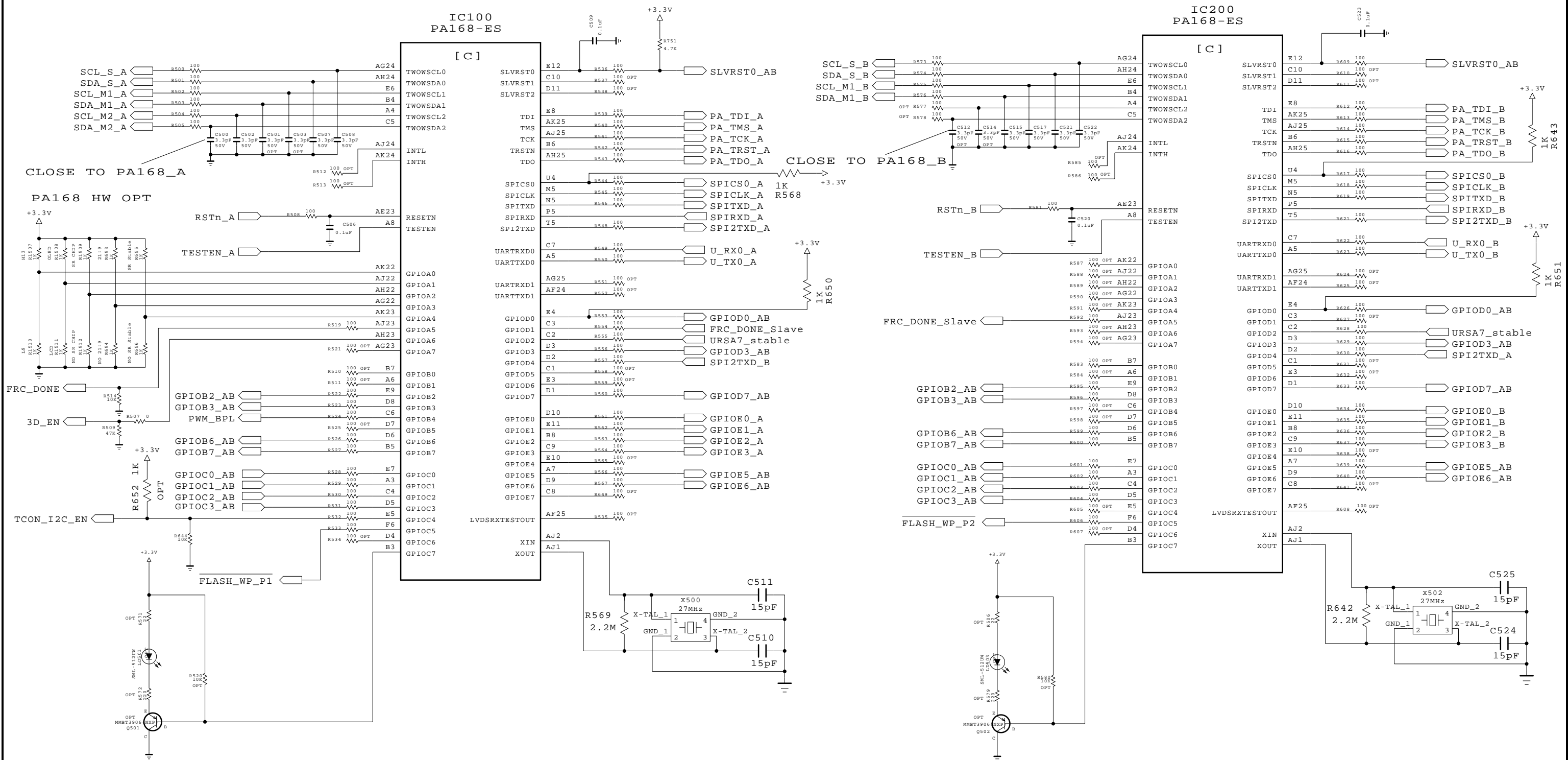
MODEL	EAX65309301	DATE	2013.03.18
BLK	P_Vx1 OUTPUT	SHEET	4 / 22





MODEL	EAX65309301	DATE	2013.03.18
BLOCK	P_DDR_B	SHEET	6 / 22



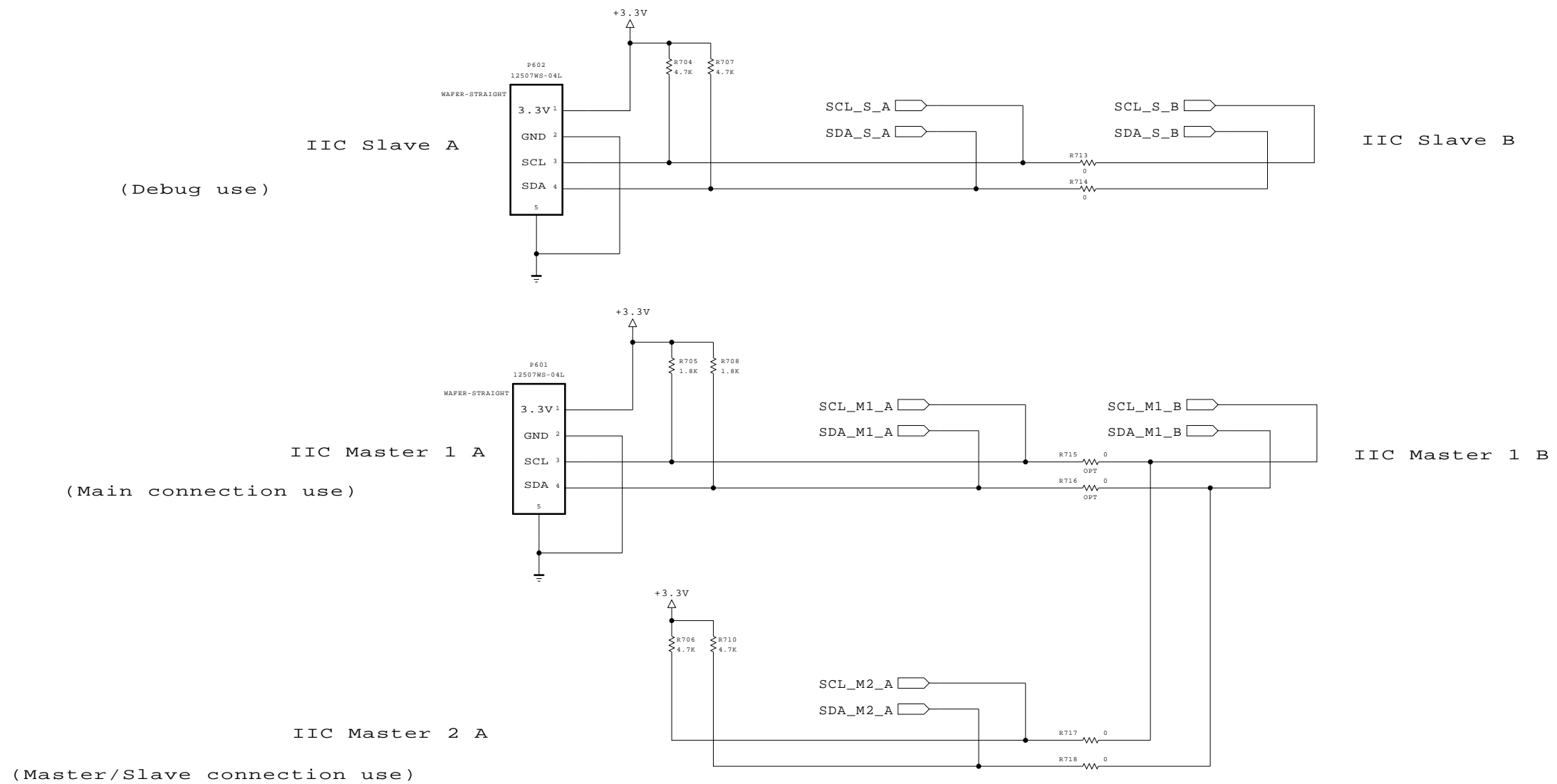
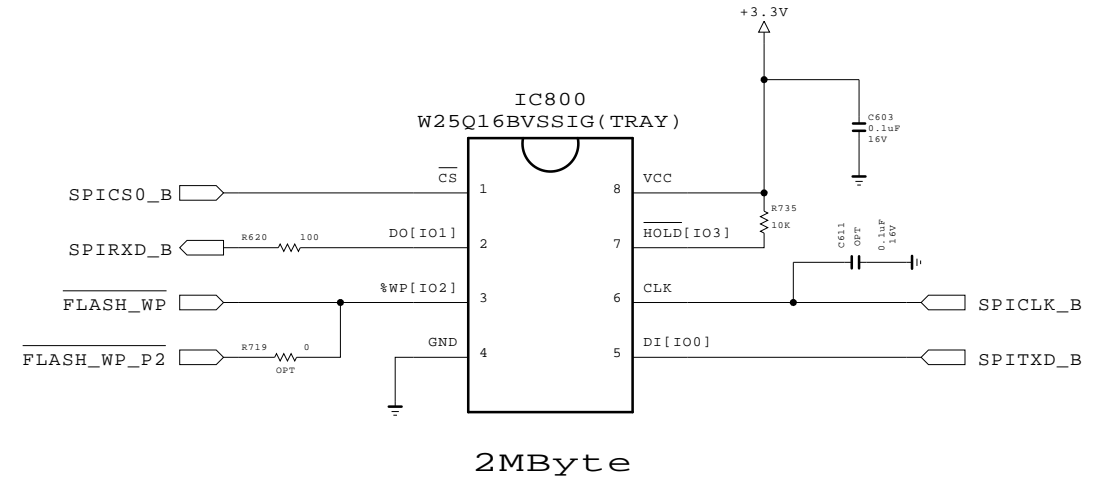
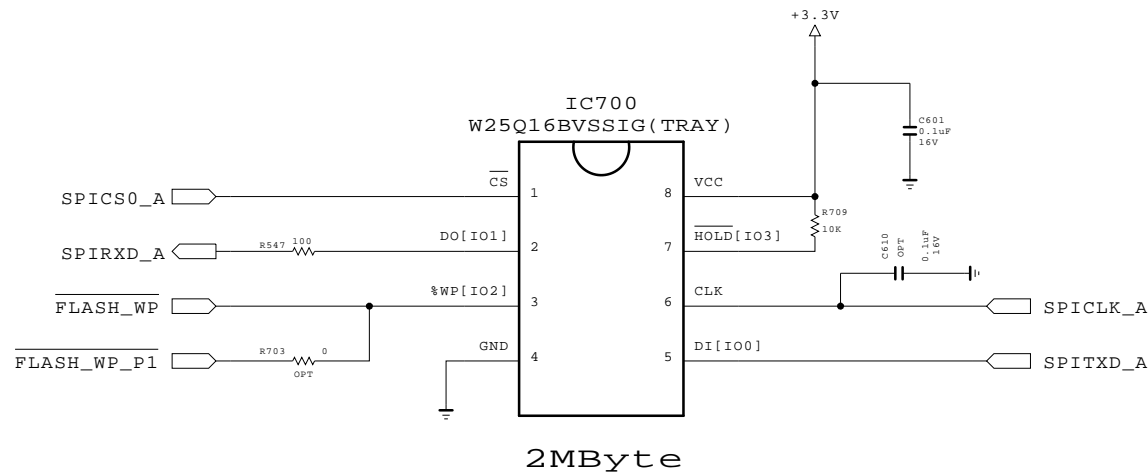




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MODEL	EAX65309301	DATE	2013.03.18
BLOCK	P_GPIO_AB	SHEET	8 / 22



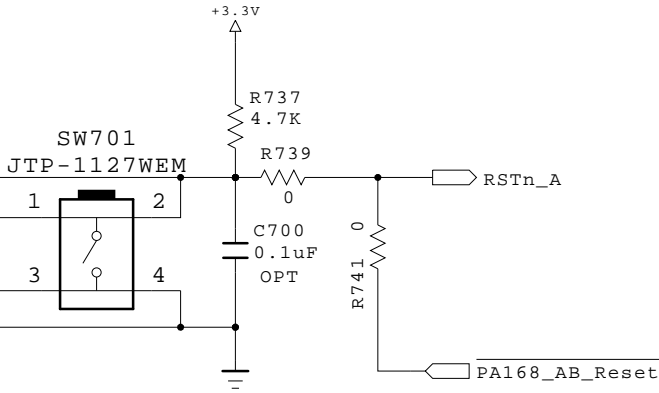
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

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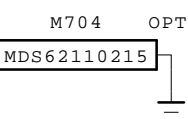
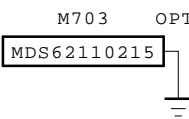
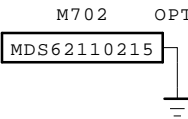
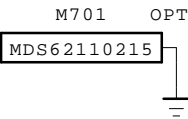
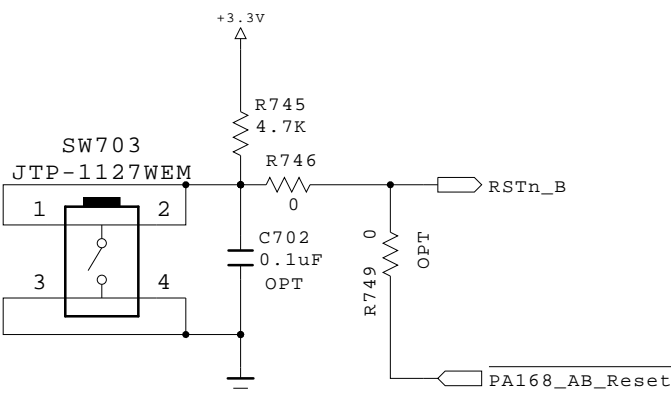




MODEL	EAX65309301	DATE	2013.03.14
BLOCK	P_SPI, IIC	SHEET	9 / 22

Master A



Master B

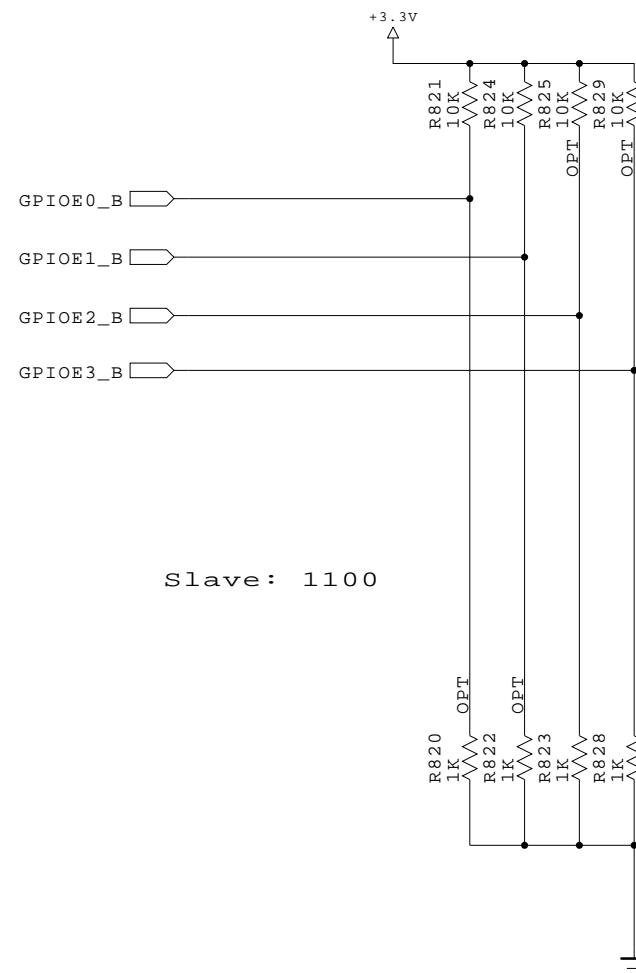
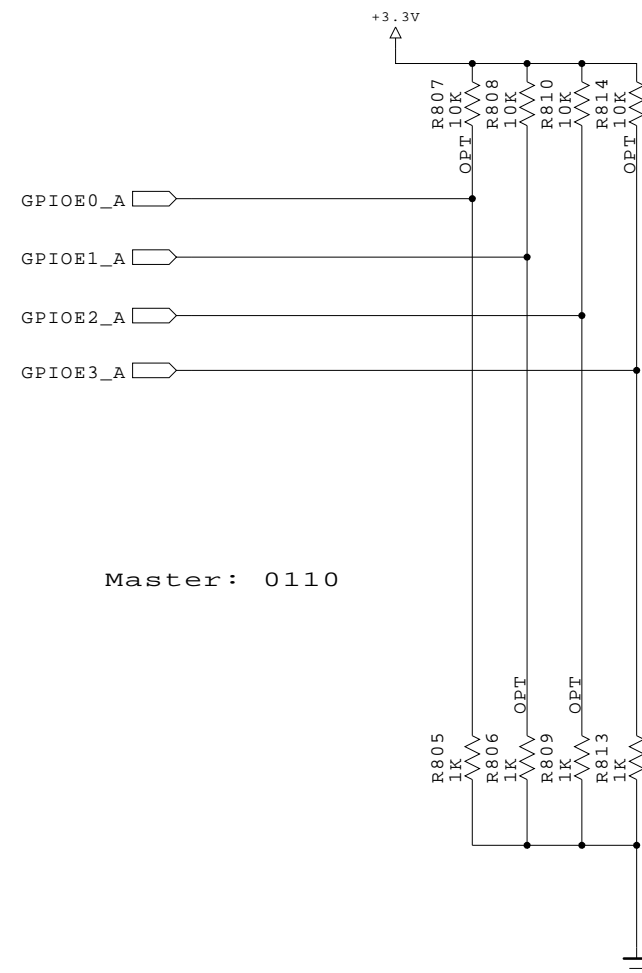
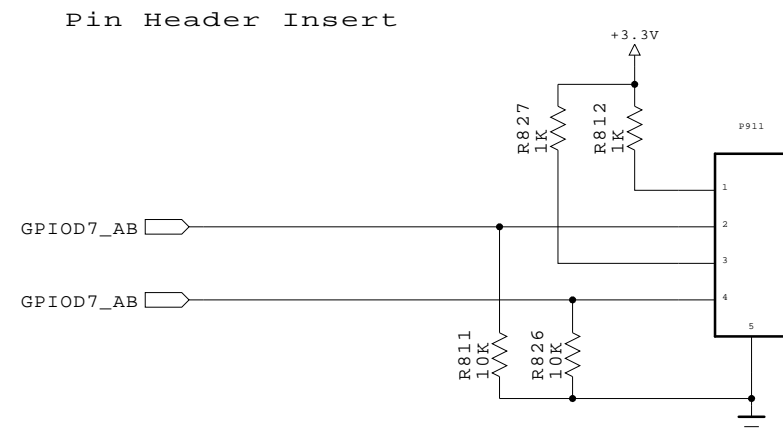


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SECRET  
LGElectronics



MODEL	EAX65309301	DATE	2013.03.18
BLOCK	P_RESET	SHEET	10 / 22



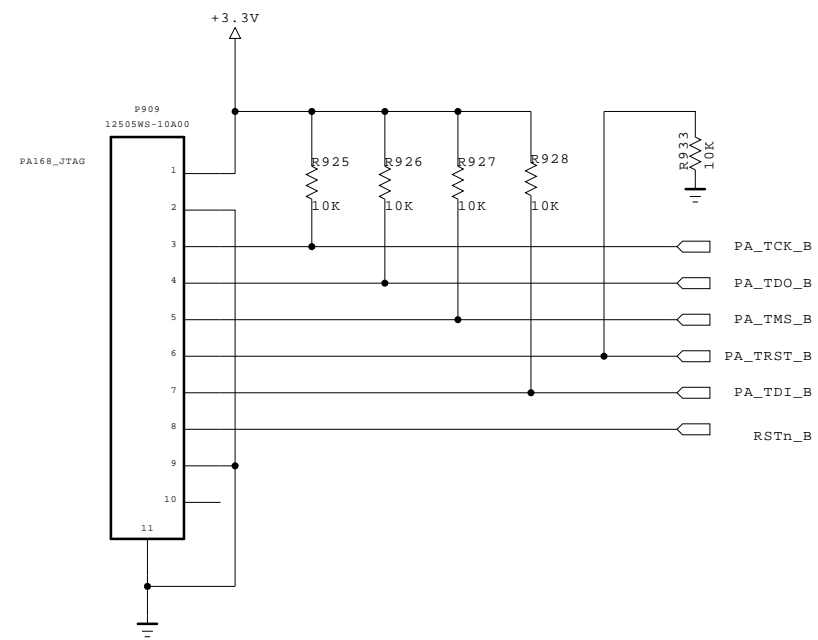
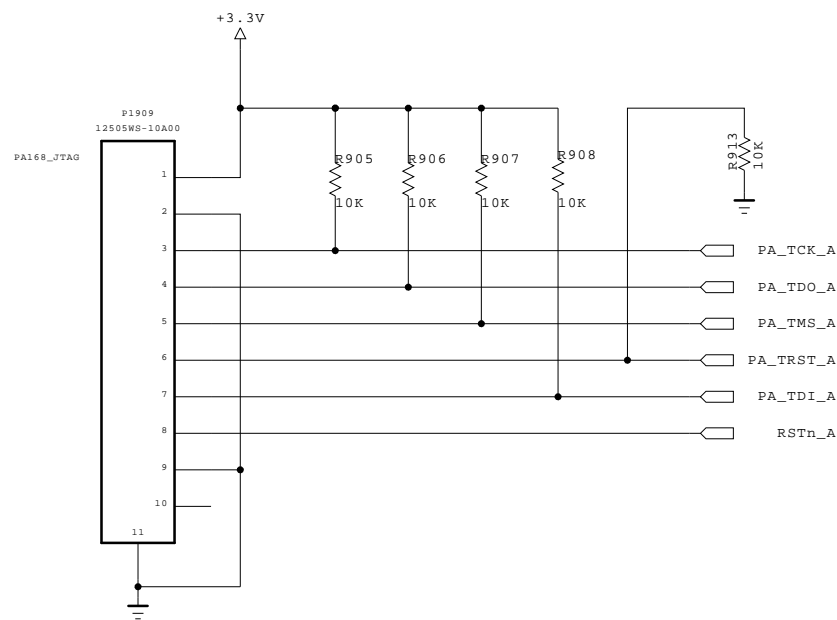
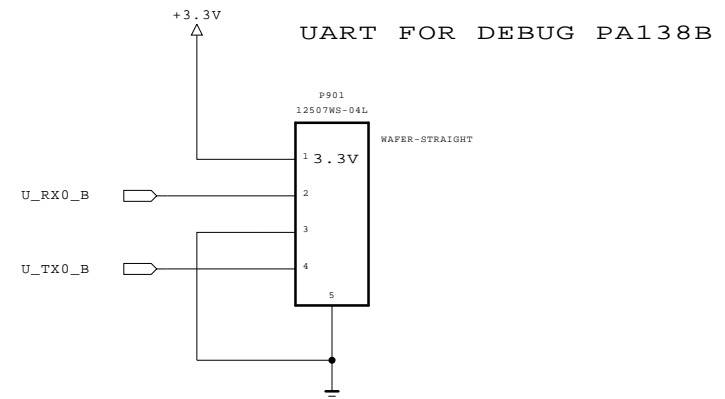
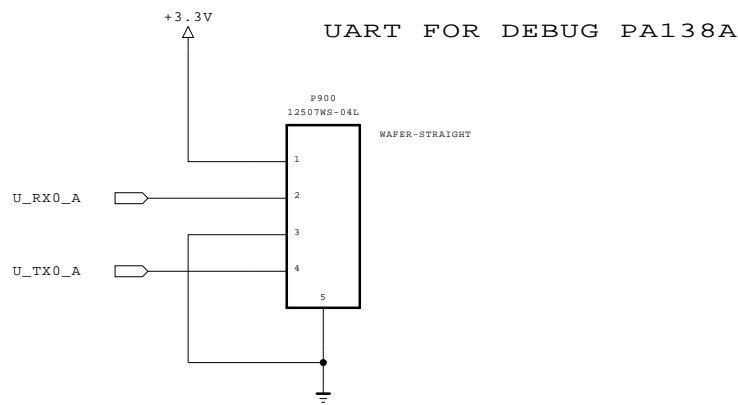
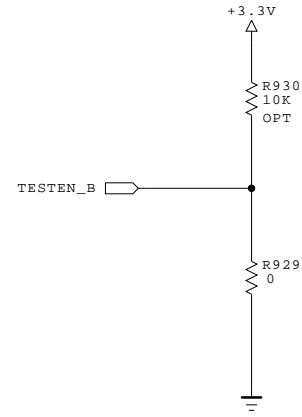
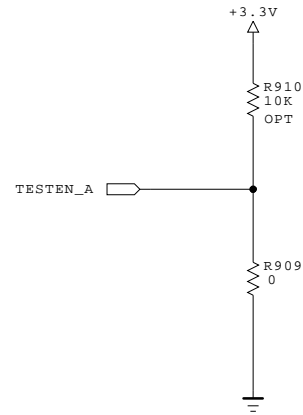
Name	Function
Bootstrap0	0:From SPI Flash 1:From internal ROM
Bootstrap1	0:PA168 WORKS as the master chip 1:PA168 WORKS as the slave chip
Bootstrap2 Bootstrap3 Bootstrap4	TWOWO bus address selection



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET  
LGElectronics



MODEL	EAX65309301	DATE	2013.03.18
BLOCK	P_BOOTSTRAP	SHEET	11 / 22

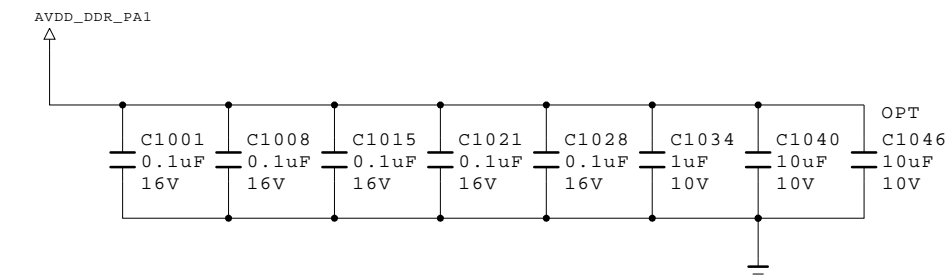
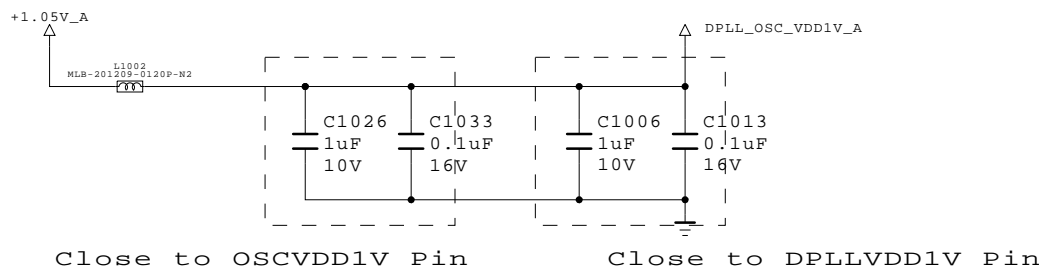
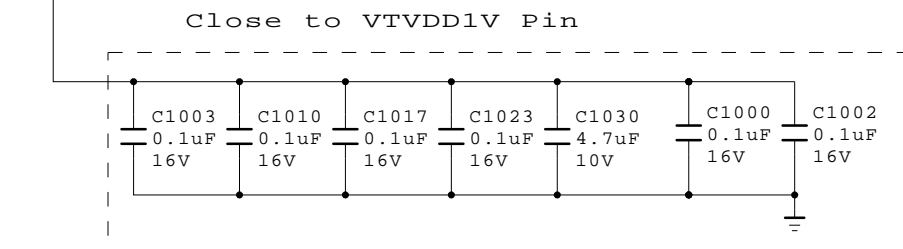
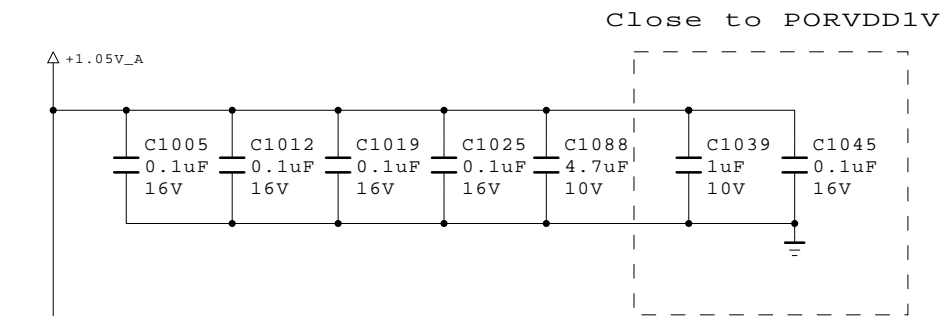
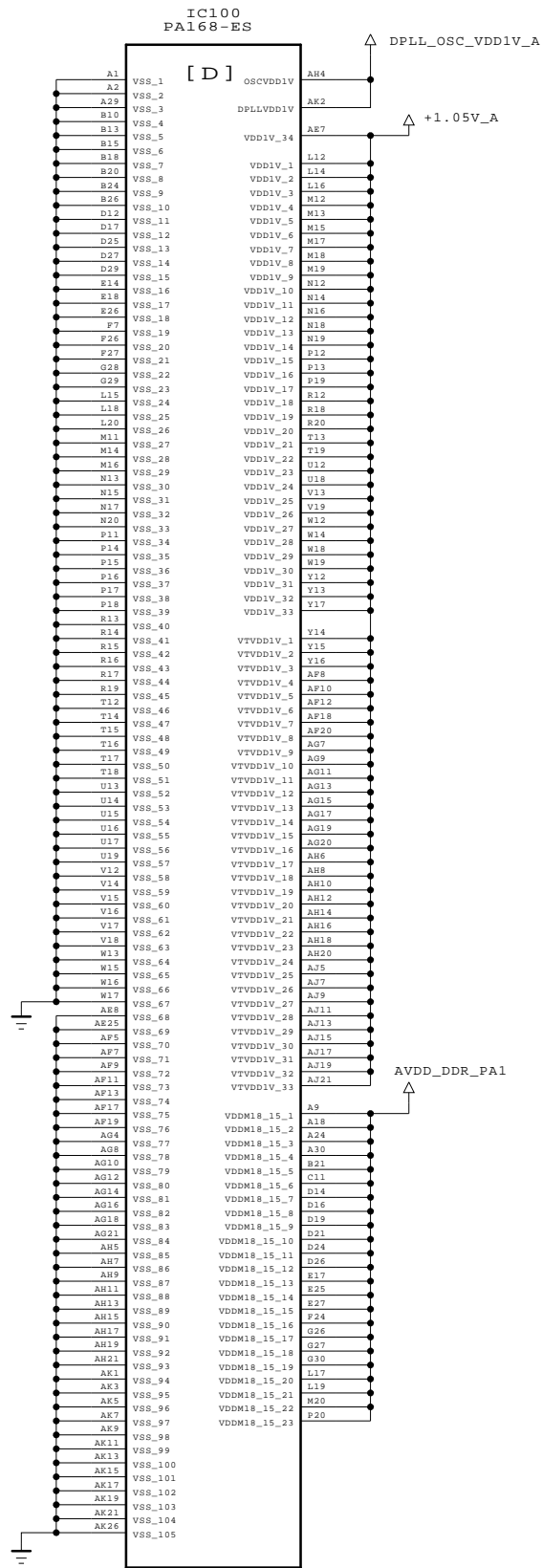




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SECRET  
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MODEL	EAX65309301	DATE	2013.03.18
BLOCK	P_UART, JTAG	SHEET	12 / 22

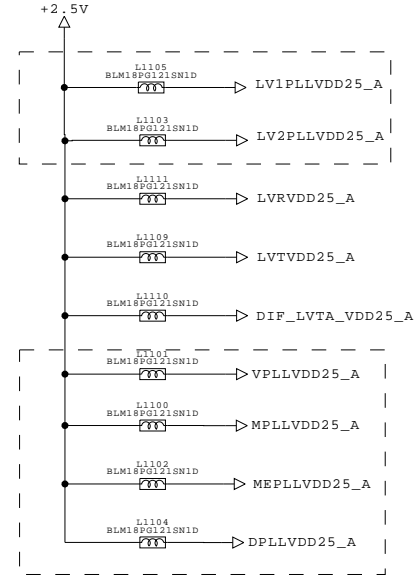
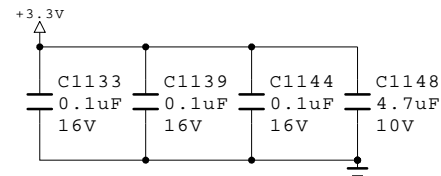
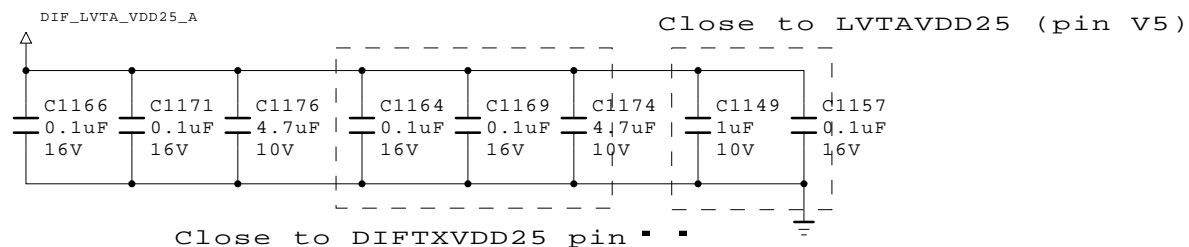
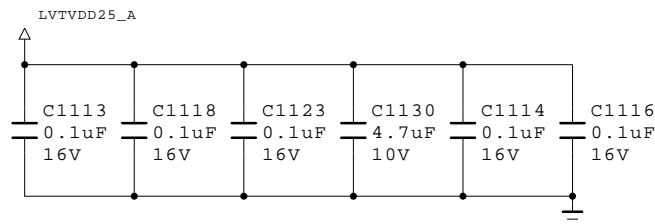
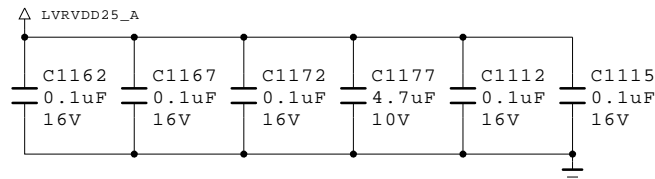
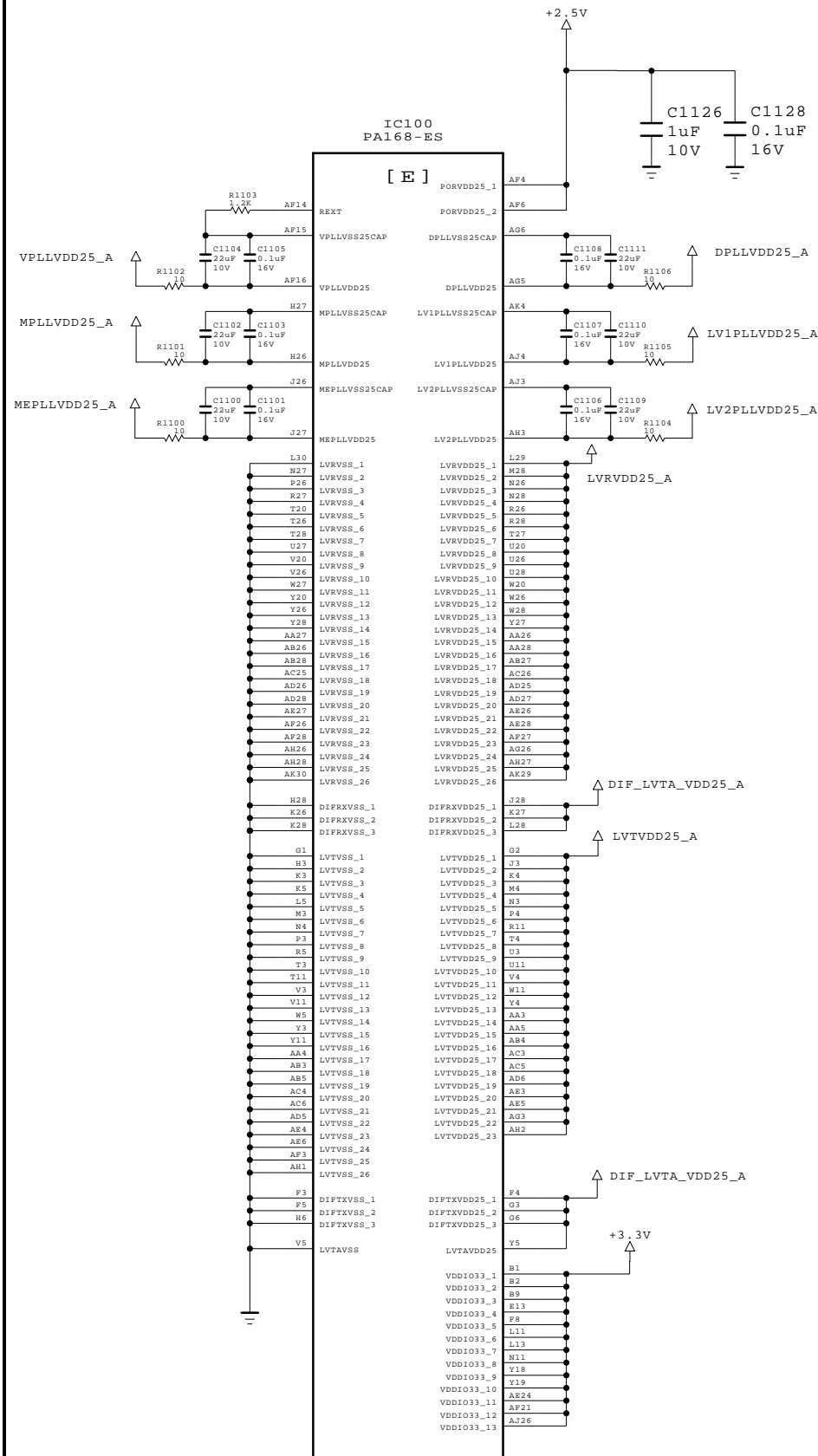




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SECRET  
LGElectronics



MODEL	EAX65309301	DATE	2013.03.18
BLOCK	PA168_POWER_A1	SHEET	13 / 22

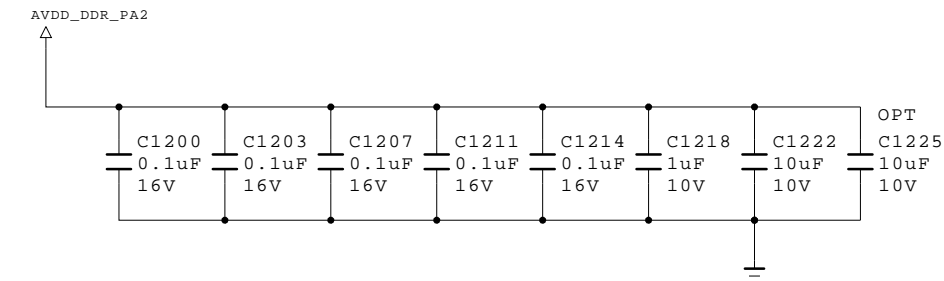
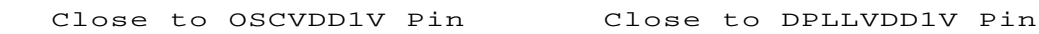
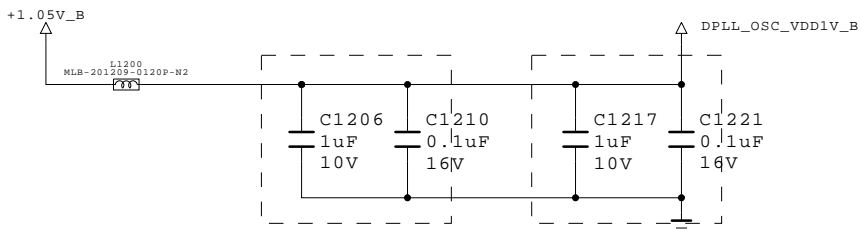
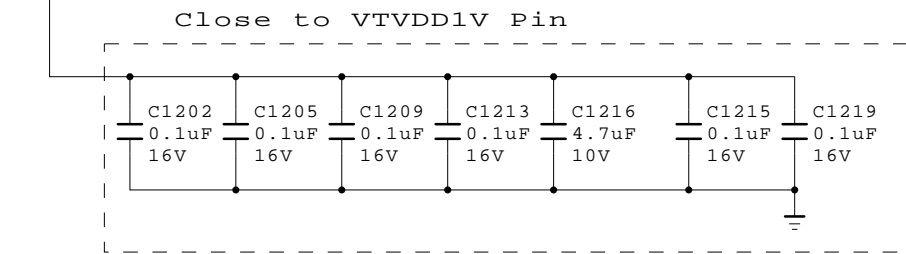
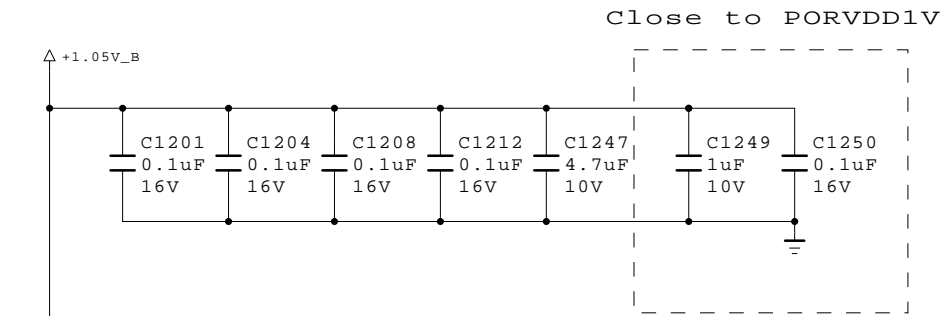
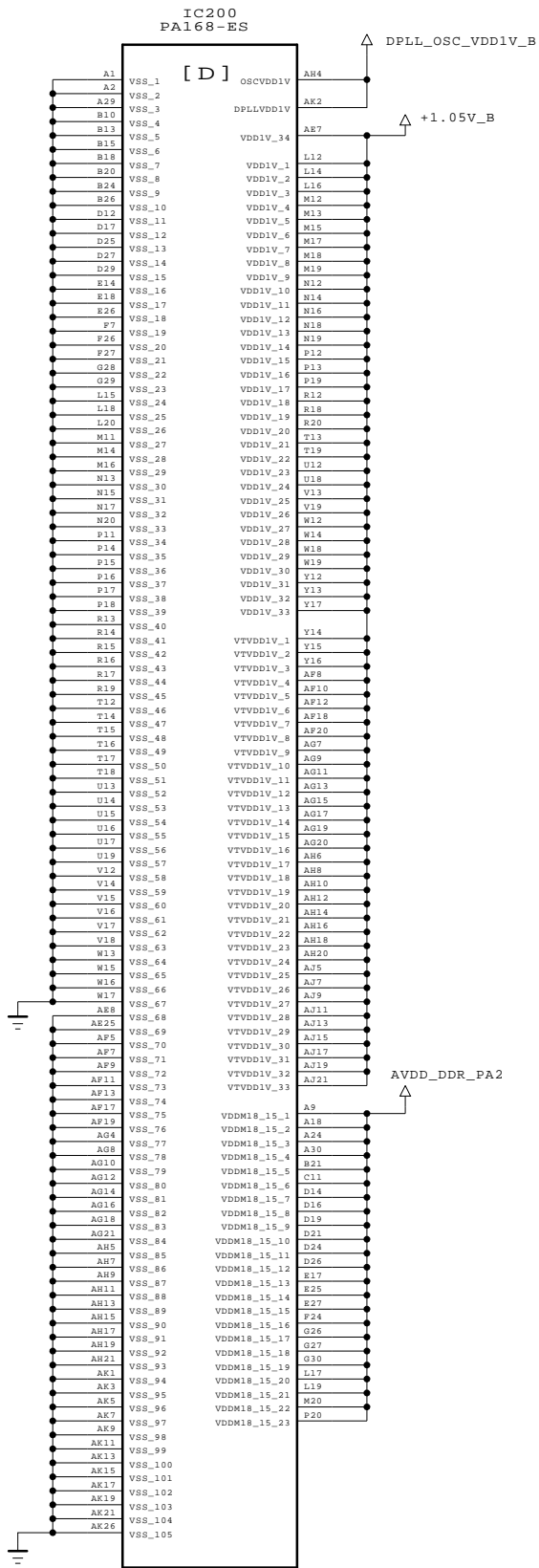




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SECRET  
LGElectronics



MODEL	EAX65309301	DATE	2013.03.18
BLOCK	PA168_POWER_A2	SHEET	14 / 22



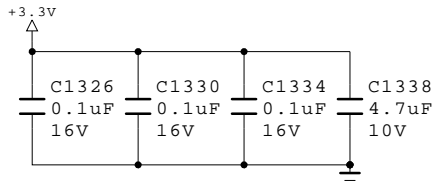
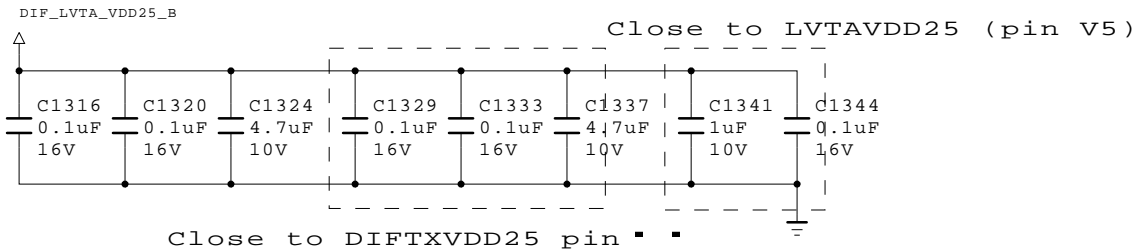
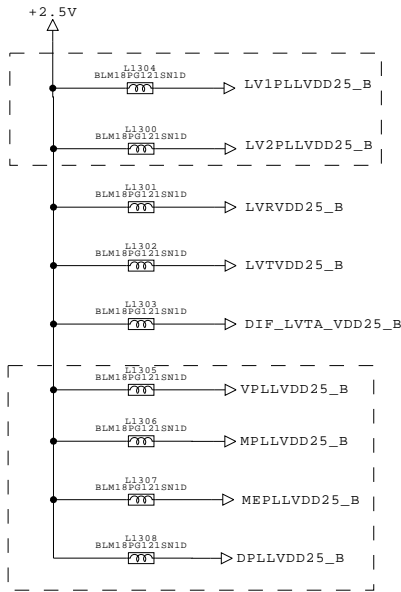
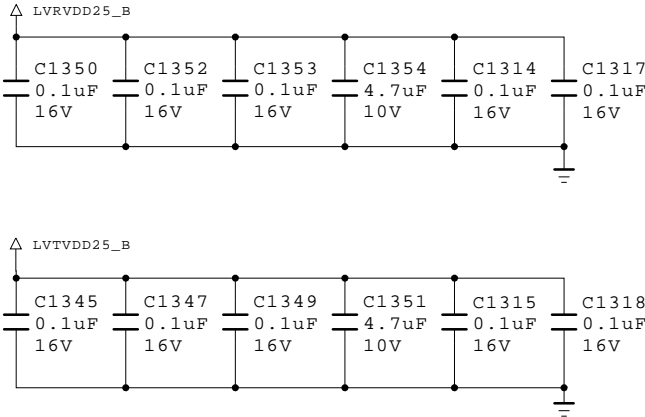
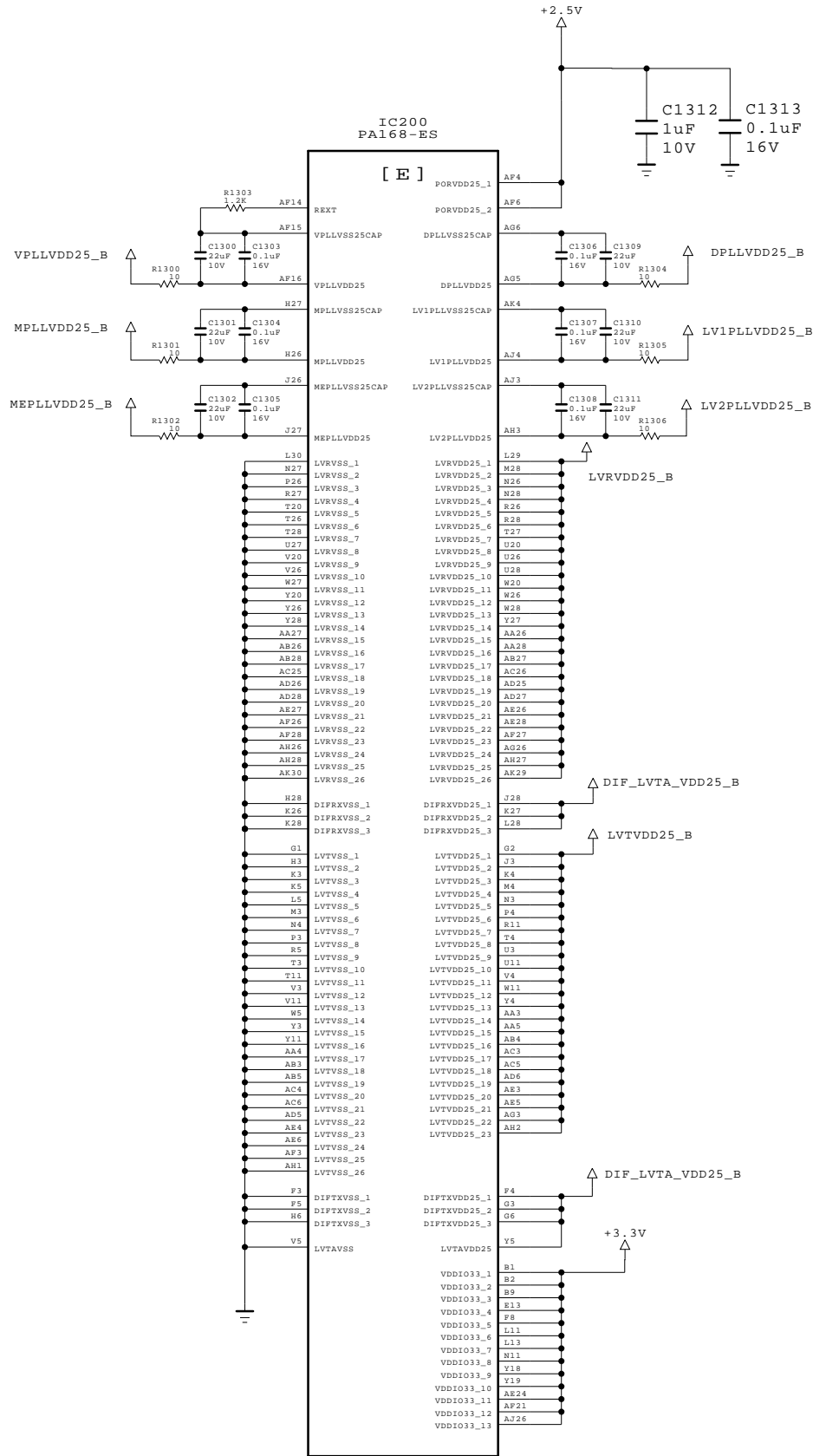
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.



SECRET  
LGElectronics



MODEL	EAX65309301	DATE	2013.03.18
BLOCK	PA168_POWER_B1	SHEET	15 / 22





THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

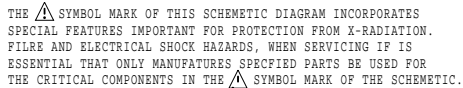
SECRET  
LGElectronics



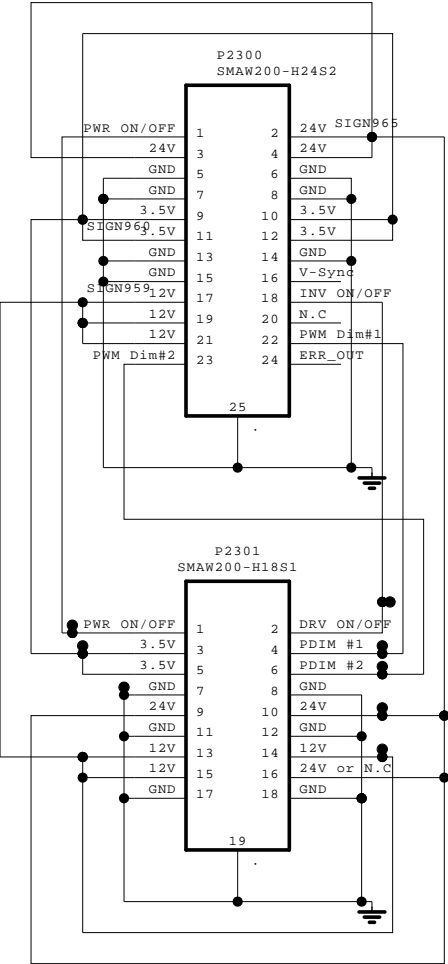
MODEL	EAX65309301	DATE	2013.03.18
BLOCK	PA168_POWER_B2	SHEET	16 / 22













THE  SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMETIC.

SECRET

LGElectronics

 LG ELECTRONICS

MODEL	EAX65313101	DATE	2013.04.08
BLOCK	24P -> 18P	SHEET	23 / 23



# **LCD TV Repair Guide**

**`13 years New Models**

**< Applicable Model >**

**\*\*LA965\*-Z\***

**\*\*LA970\*-Z\***

**84LM96/LA980\*-ZD**

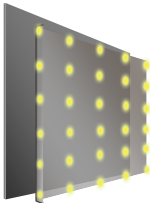


# **Overview for '13 Broadband Model EU/CIS (Hardware)**

# 2 types of LED – ALEF

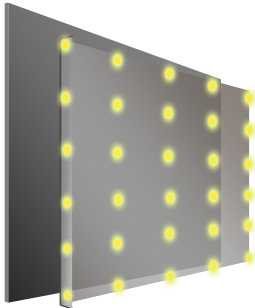
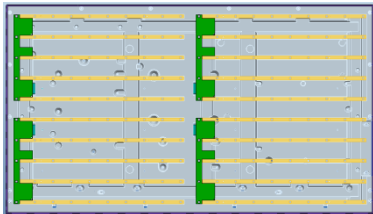


Benefit: More Clear More Real



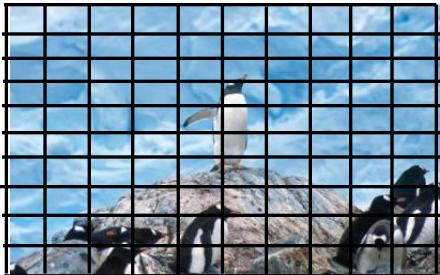
## ALEF Type Local Dimming

BLU  
structure



LED Array is on the side of Module

Local  
Dimming



### Feature

<i>ALEF Type</i>	Best picture quality + thin TV
<i>Local Dimming</i>	Local dimming depicts more deep black.

### Model

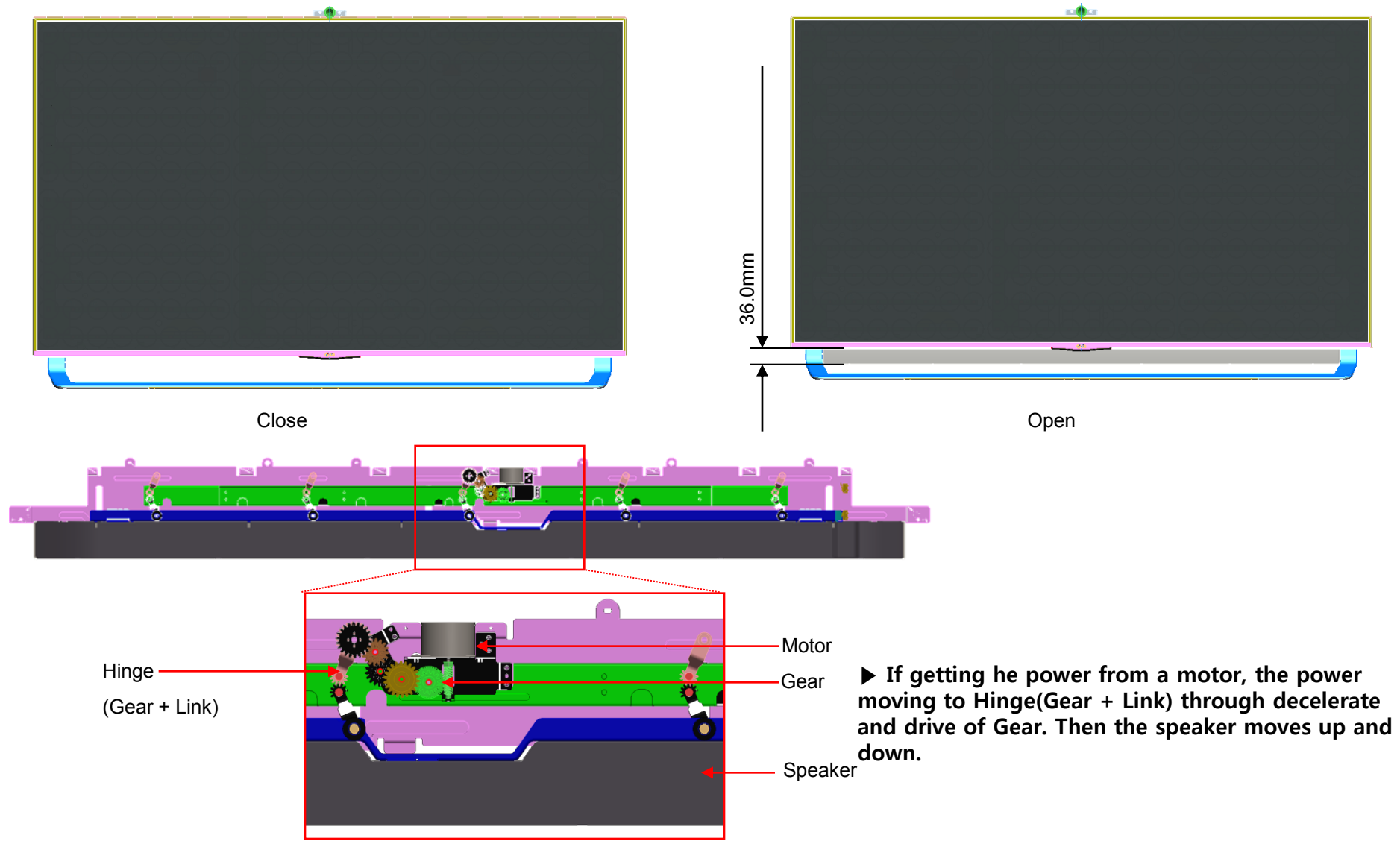
**XXLA970\*-ZA**

**55inch : H(10) \* V(10) = 100Block**

**\*65inch : H(12) \* V(12) = 144Block**

# Sliding SPK Mechanism

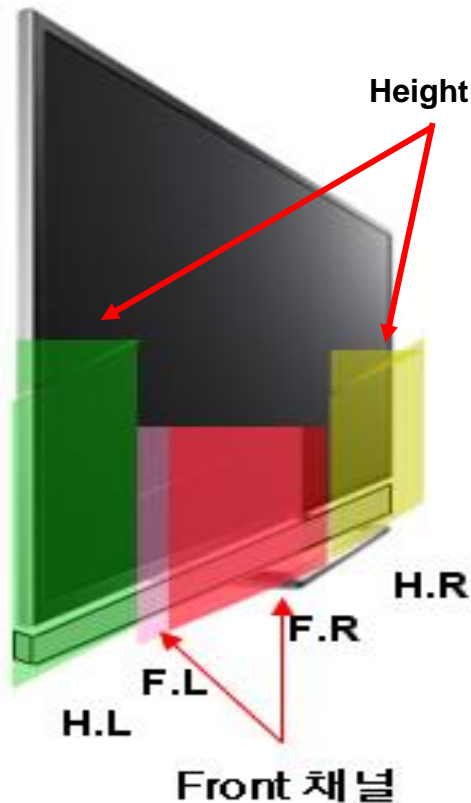
※ Moving Speaker Stroke : 41.0mm



## 4.1ch audio (Height channel Surround)

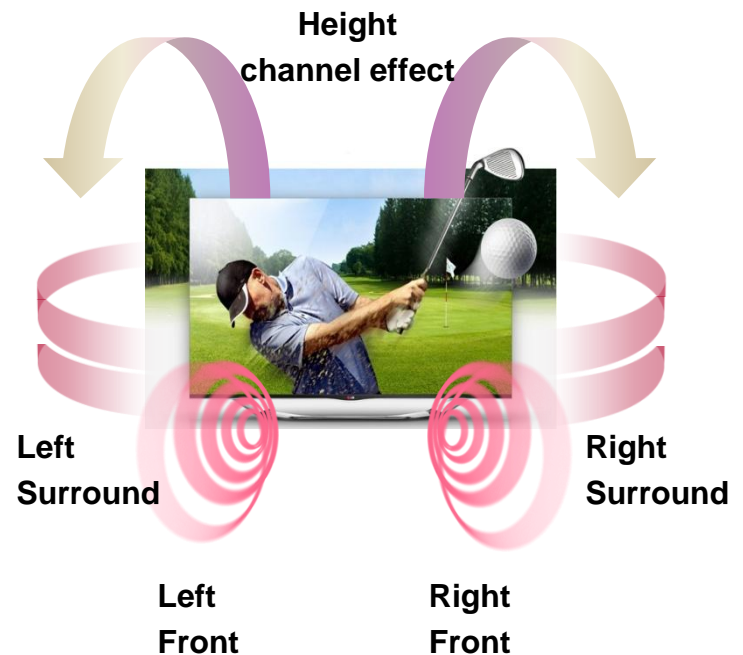
UHD to develop into a three-dimensional multi-channel broadcasting in line with changes in the environment worthy of Sound feature as UHD TV "Height-channel surround" suggested.

Known that the benefits of the Stereo Look TV's first "Height-channel surround" is implemented with the introduction of LG's unique concept of surround pouring like waterfalls Height surround the filling of the wide screen Multi-channel UHD maximize the effect.



Fundamental channel and the surround channels being played on the Front Height surround effect is applied. So implementation of a complex Multi-channel effects.

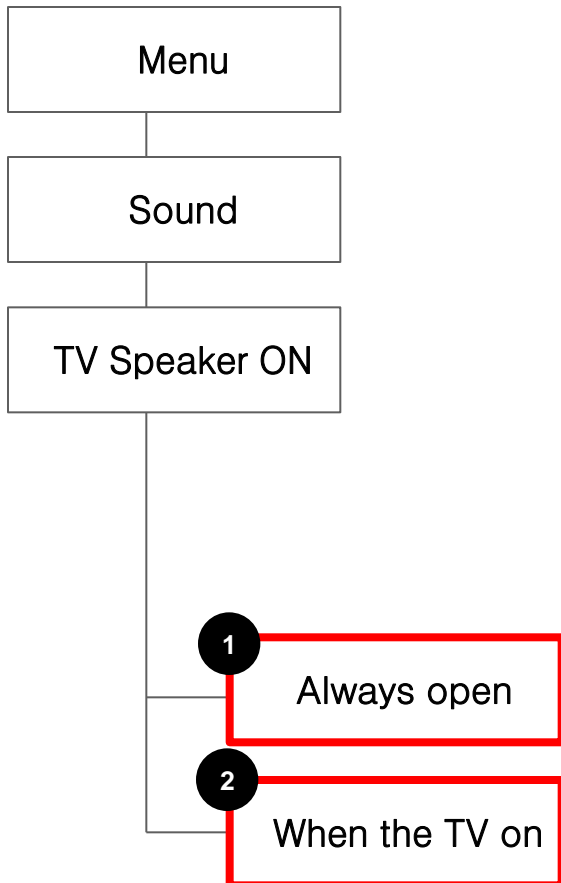
→ UHD TV worthy of implementation of multi-channel sound is differentiated from the old TV sound.



Height Channel algorithm sound image of the music that you hear two speakers located higher than the position as a technology that enables users basically at eye level (or lower place) located in the front-end or downward-oriented sound image at the bottom of the speaker that's going to be rapid temperature change , Height Channel effects of using sound image can be moved to the top.

# Sliding SPK UX

< The list of TV speaker moving >



Silent Move

**1 Always open (Magic Sound Bar)**

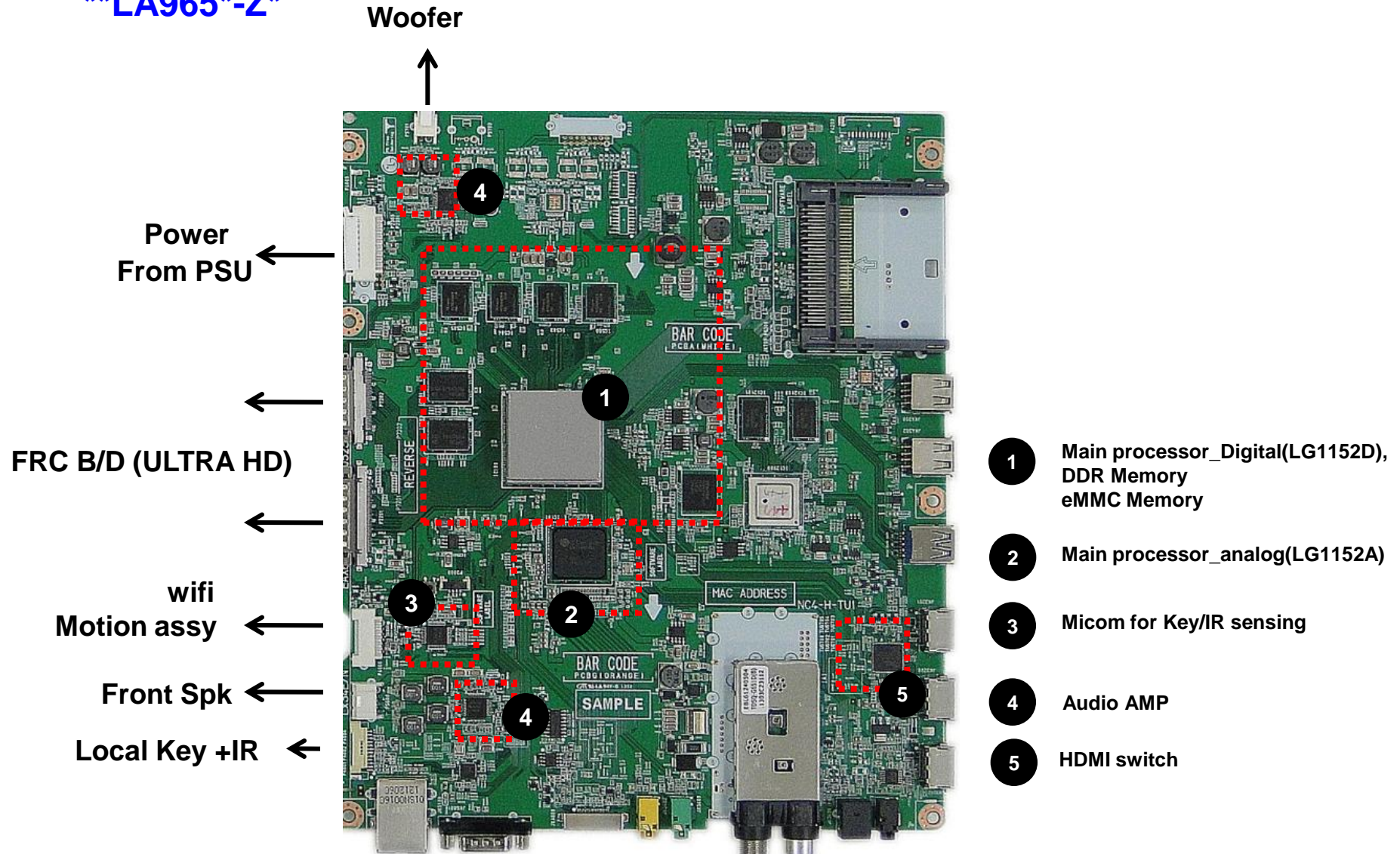
- Always Sliding Speaker exposure
- To emphasis Sound design by sound bar Looking at TV off

**2 When the TV on , open speaker (Magic Move)**

- **Automatically speaker exposure/ hide at TV on/off**
- **Minimal design at TV off**
- **Majestic sound automatically on/off without a separate setting at TV on**

# Main PCB

**\*\*LA965\*-Z\***





# Main PCB

**\*\*LA970\*-Z\***

Woofer

Height SPK

Built-in Camera



Power  
From PSU



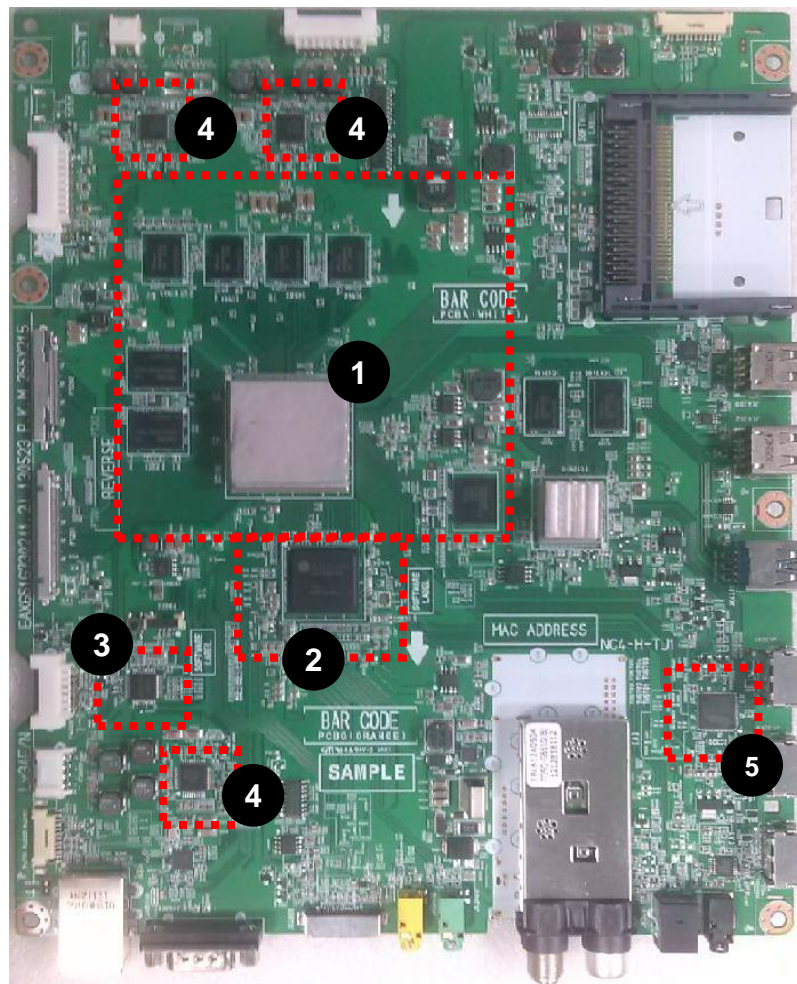
FRC B/D (ULTRA HD)



wifi  
Motion assy

Front Spk

Local Key +IR



1 Main processor\_Digital(LG1152D),  
DDR Memory  
eMMC Memory

2 Main processor\_analog(LG1152A)

3 Micom for Key/IR sensing

4 Audio AMP

5 HDMI switch

# Main PCB

84LM96/LA980V-ZD

Woofer



Power  
From PSU



FRC B/D (ULTRA HD)



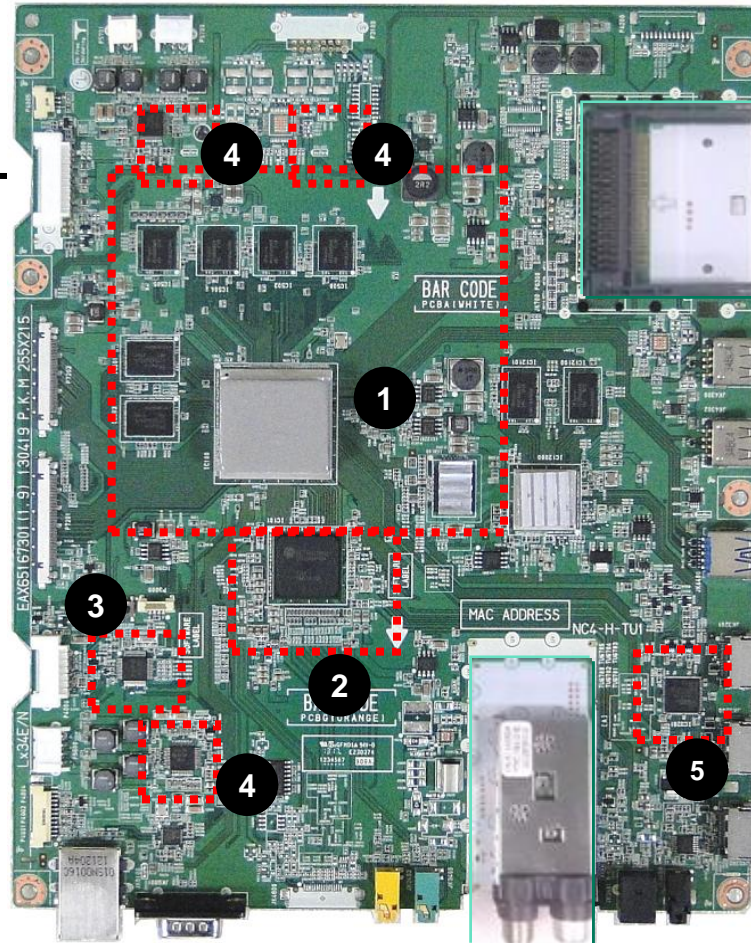
wifi  
Motion assy



Front Spk



Local Key +IR



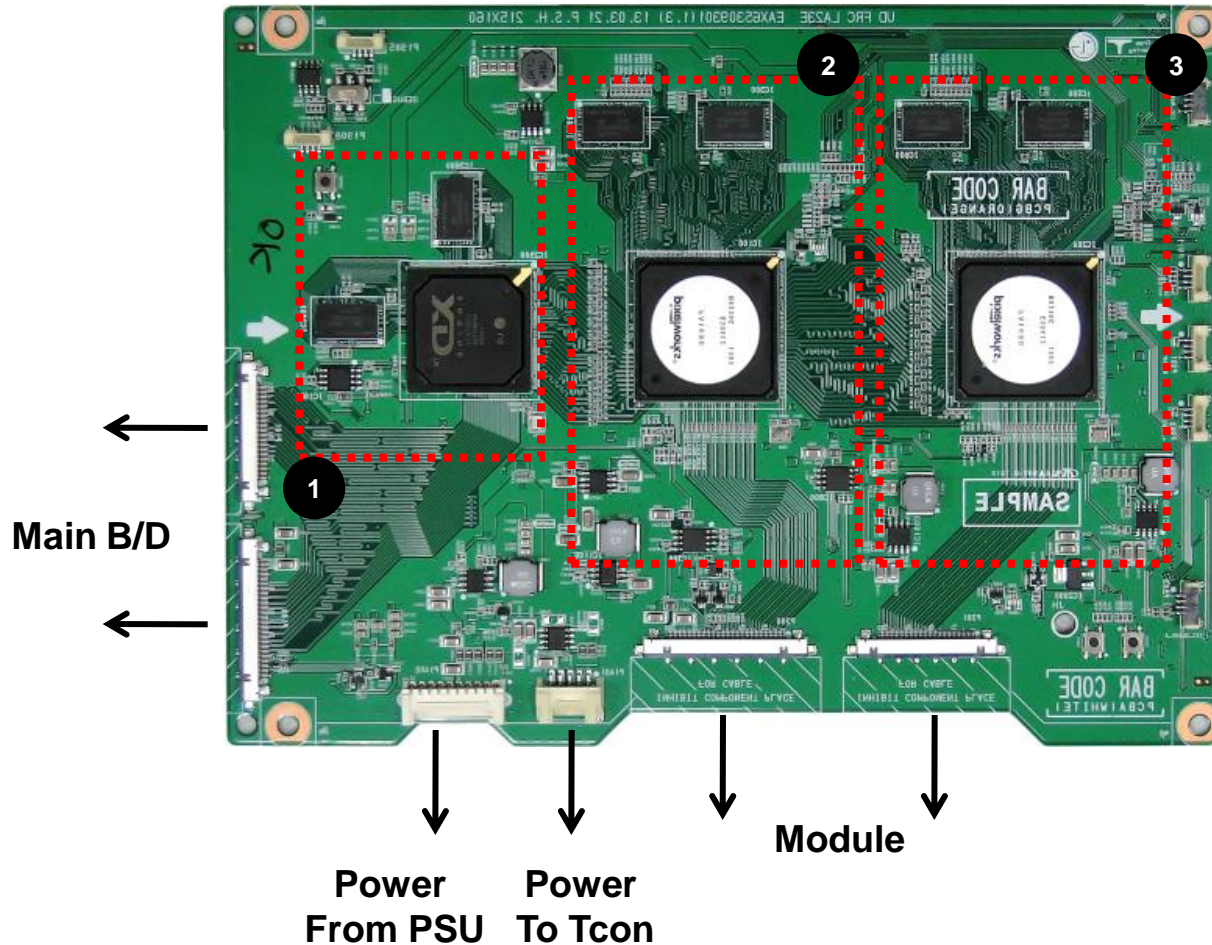
- 1 Main processor\_Digital(LG1152D),  
DDR Memory  
eMMC Memory
- 2 Main processor\_analog(LG1152A)
- 3 Micom for Key/IR sensing
- 4 Audio AMP
- 5 HDMI switch



# FRC PCB(ULTRA HD)

**\*\*LA965\*-Z\***

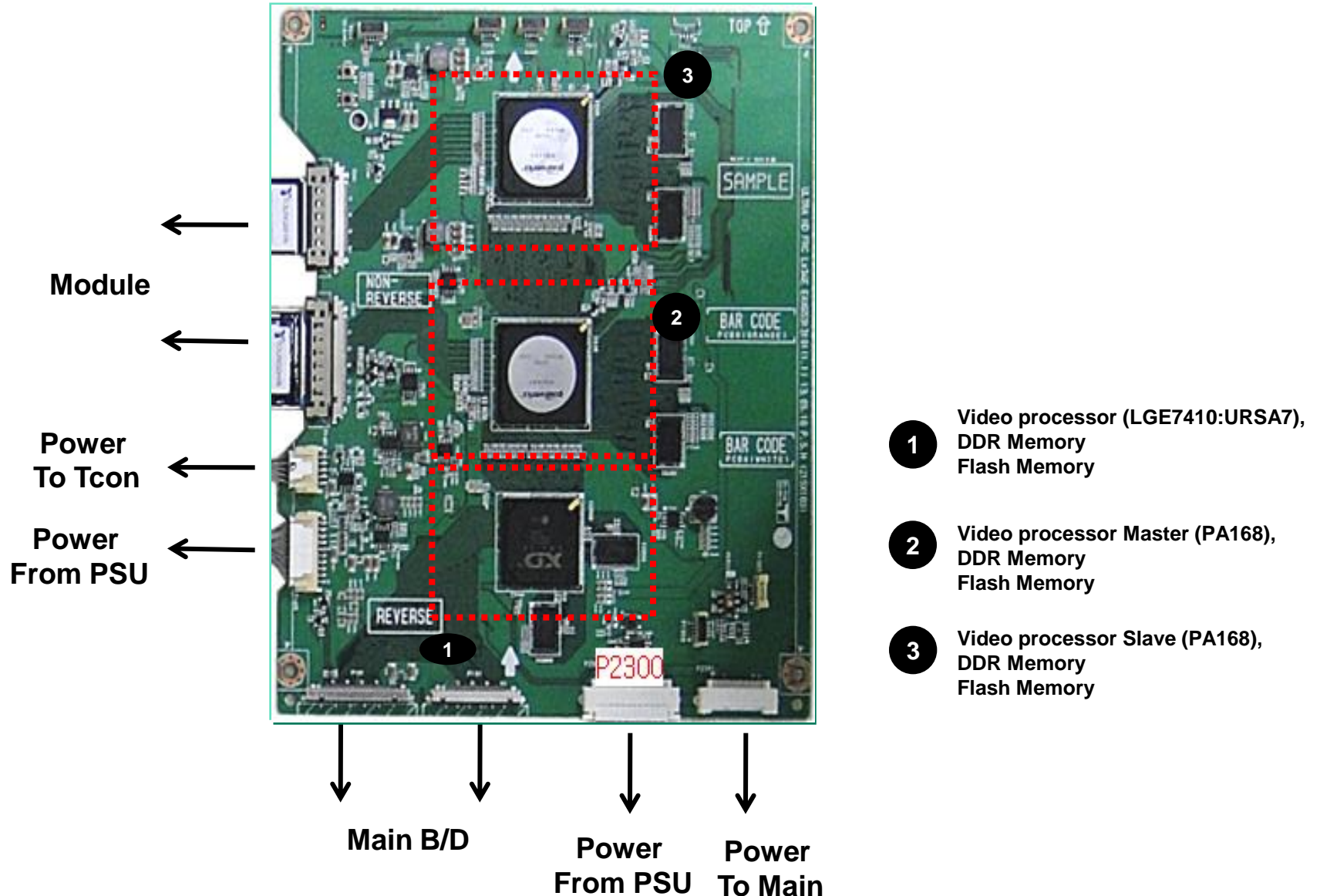
**\*\*LA970\*-Z\***



- 1** Video processor (LGE7410:URSA7),  
DDR Memory  
Flash Memory
- 2** Video processor Master (PA168),  
DDR Memory  
Flash Memory
- 3** Video processor Slave (PA168),  
DDR Memory  
Flash Memory

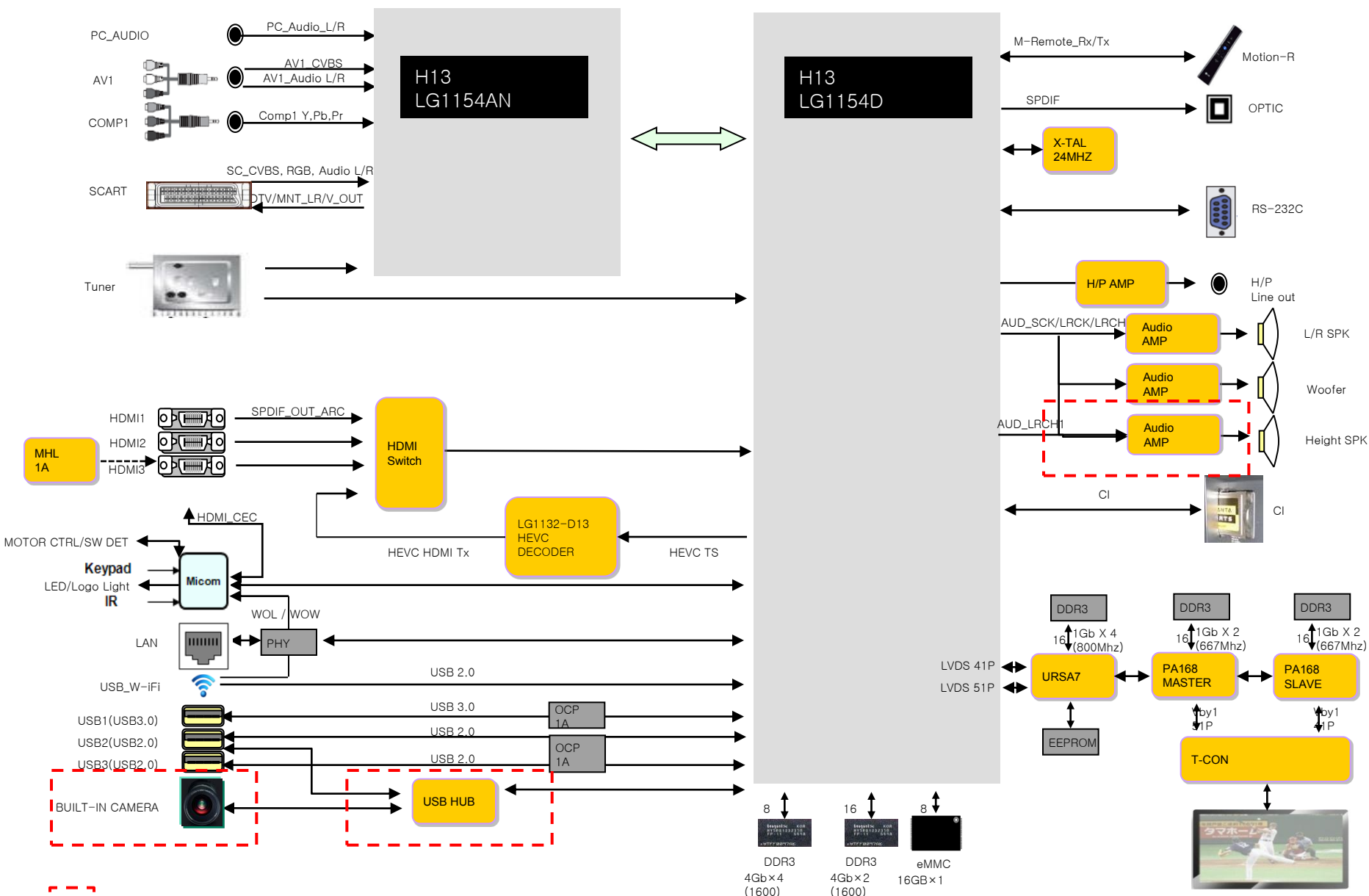
# FRC PCB(ULTRA HD)

## 84LM96/LA980V-ZD



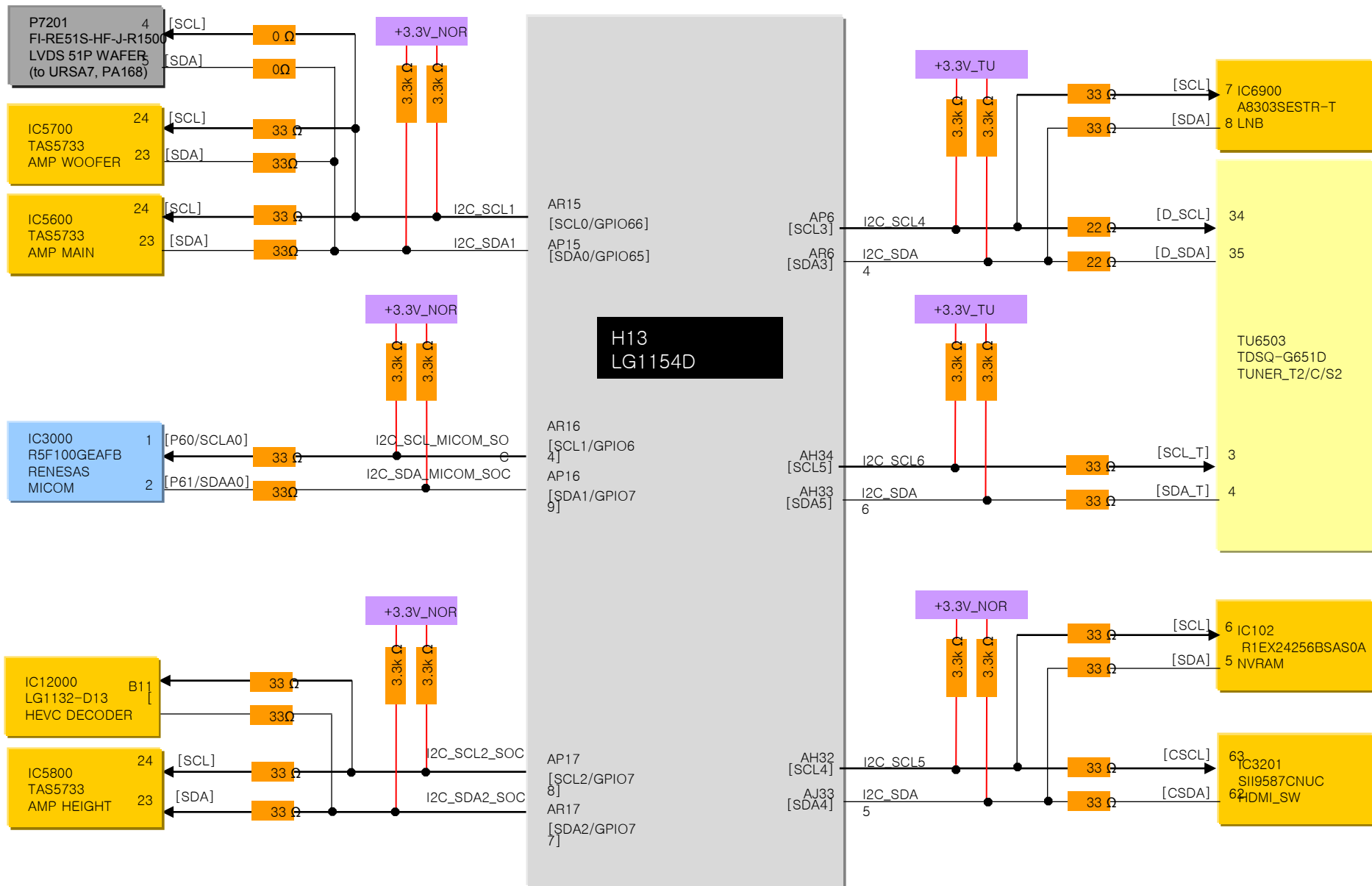
# H13 Block diagram

## External I/O



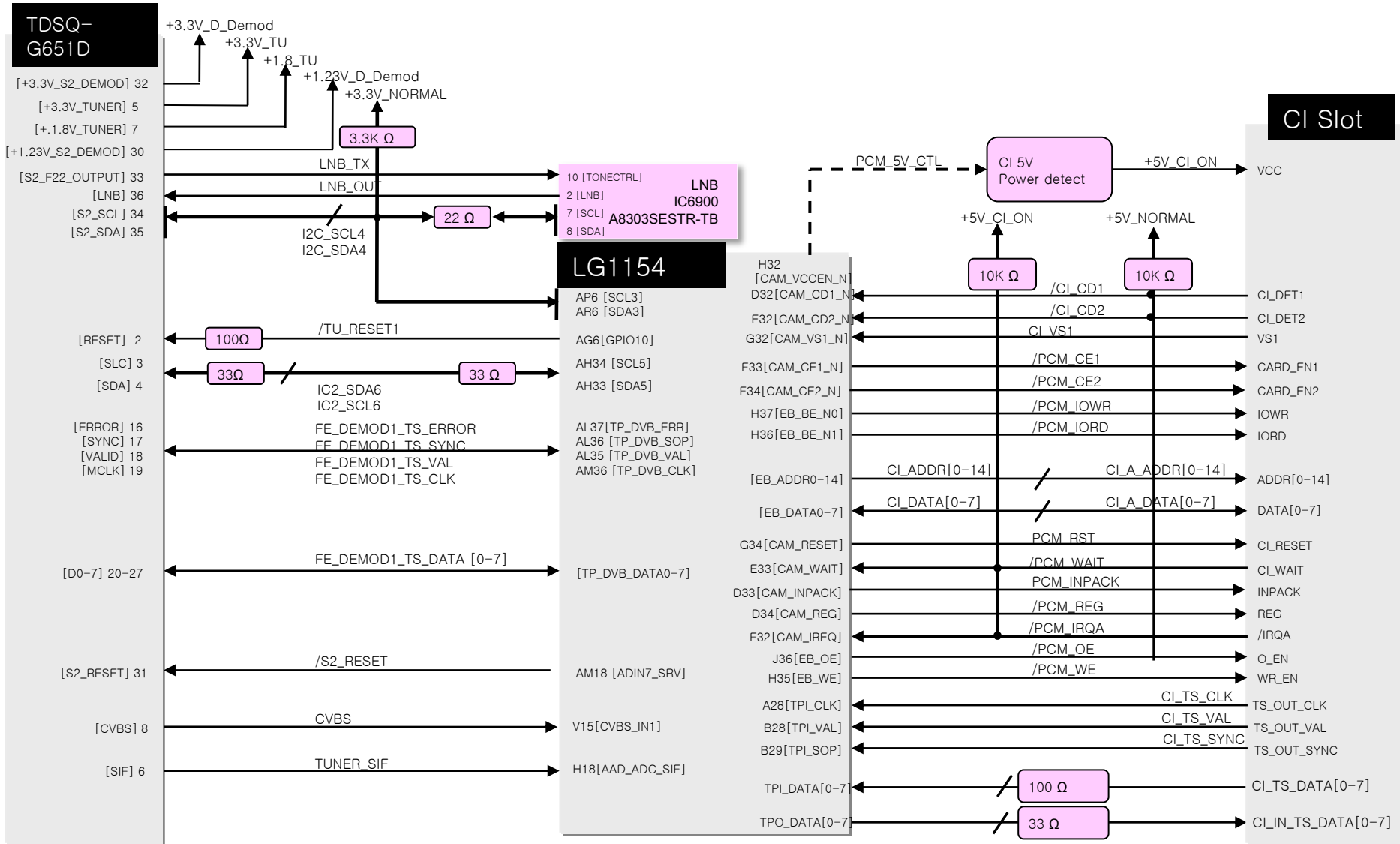
# H13 Block diagram

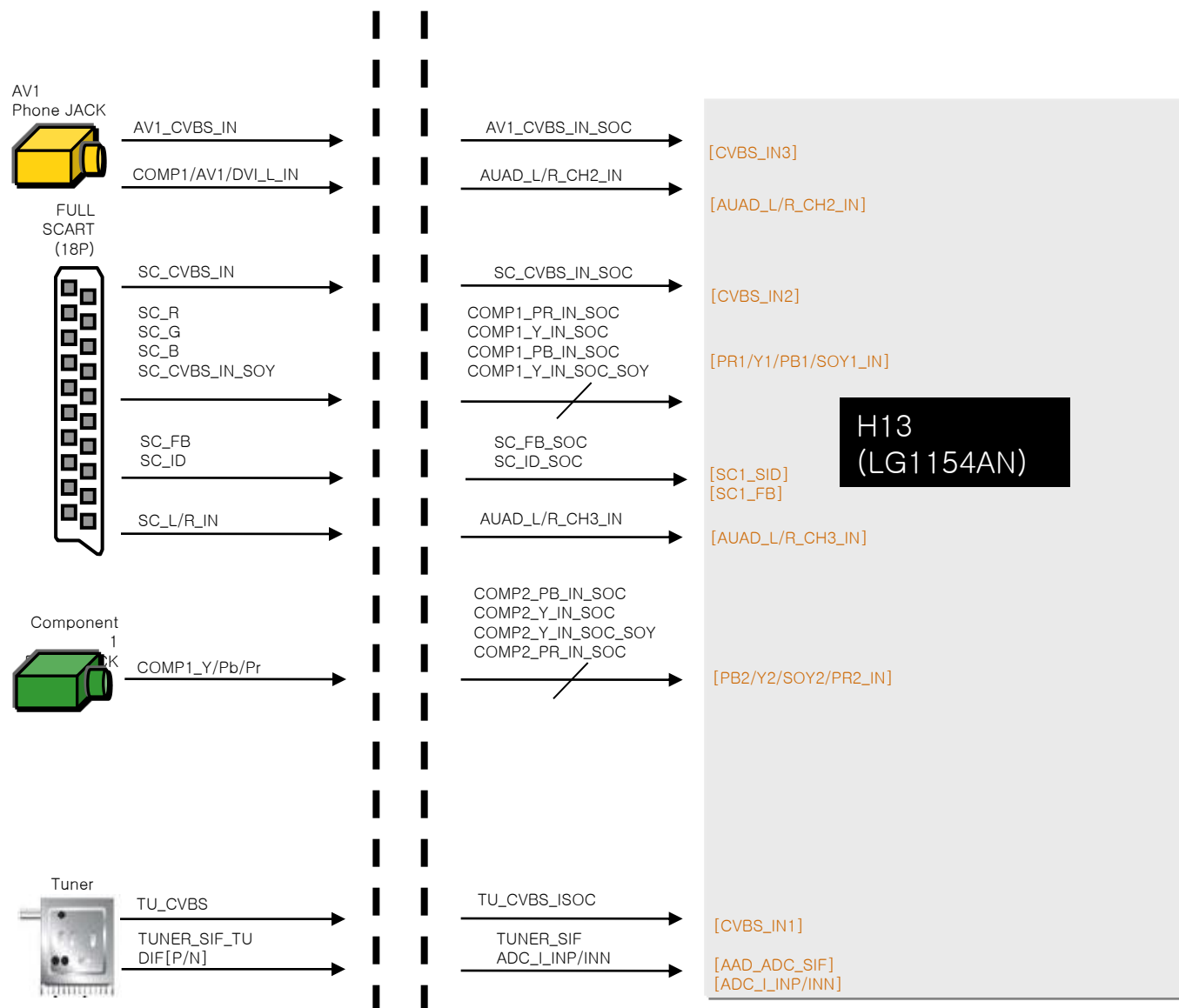
## I2C Map



# H13 Block diagram

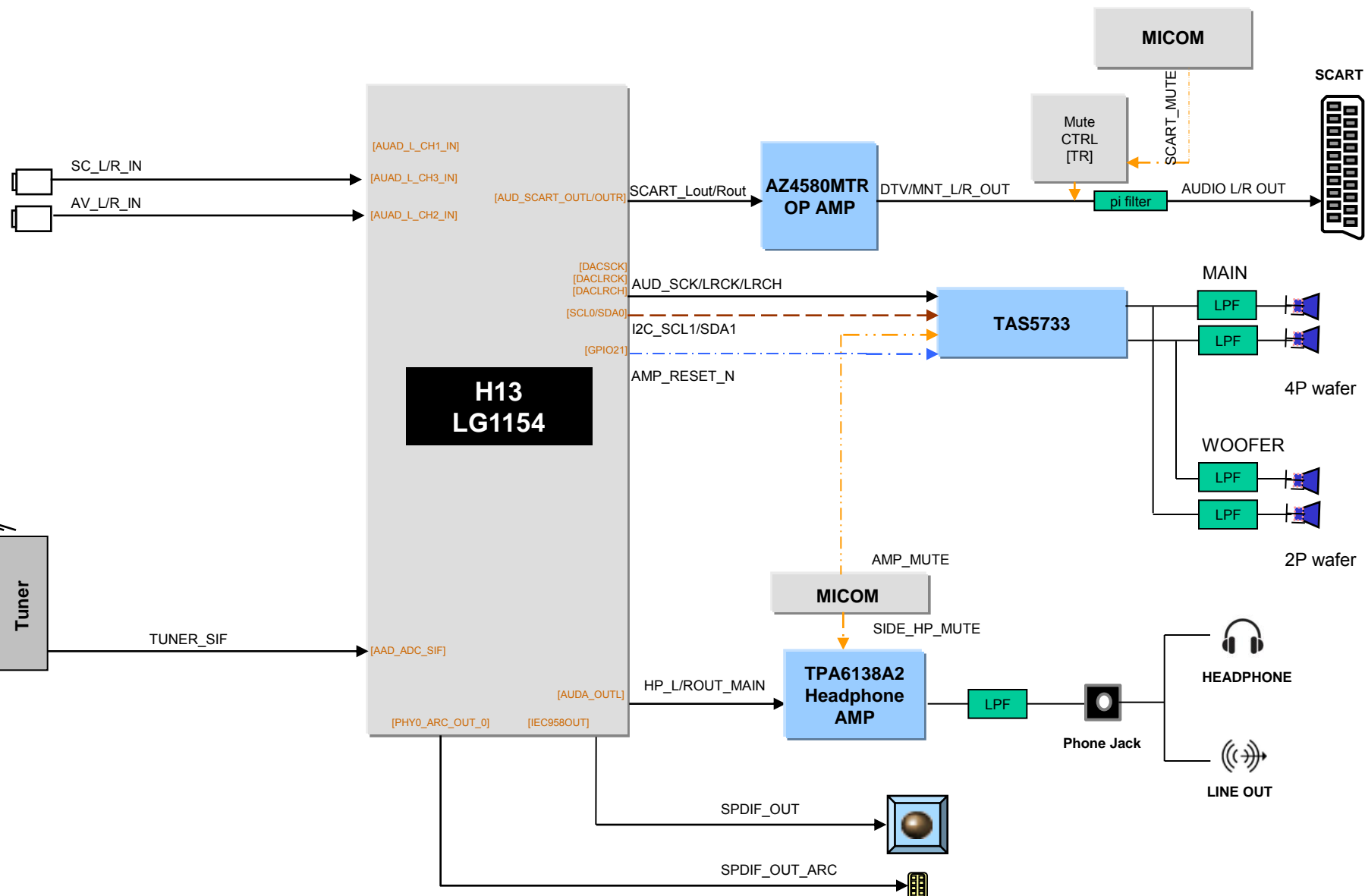
## Tuner Block



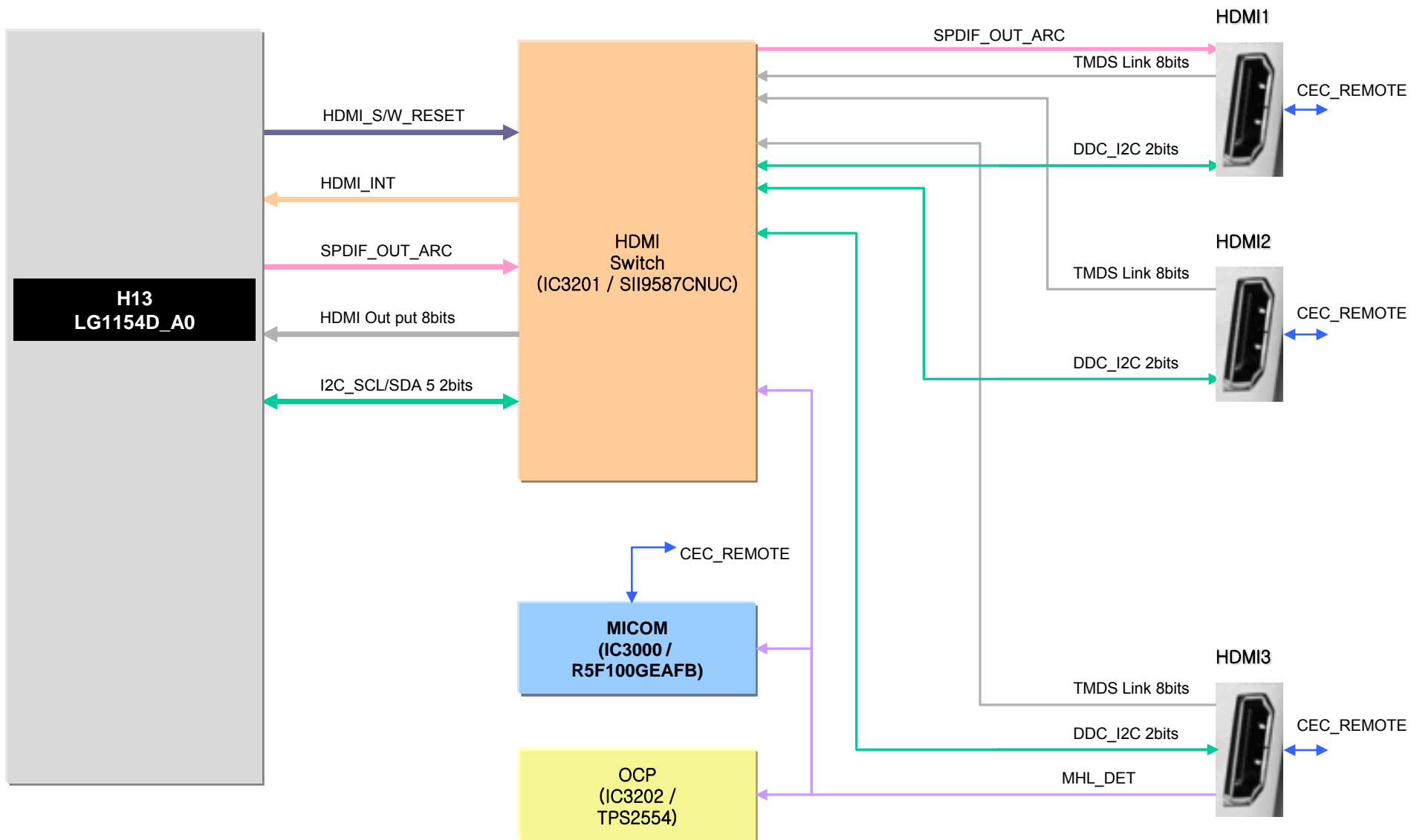


# H13 Block diagram

## Audio I/O

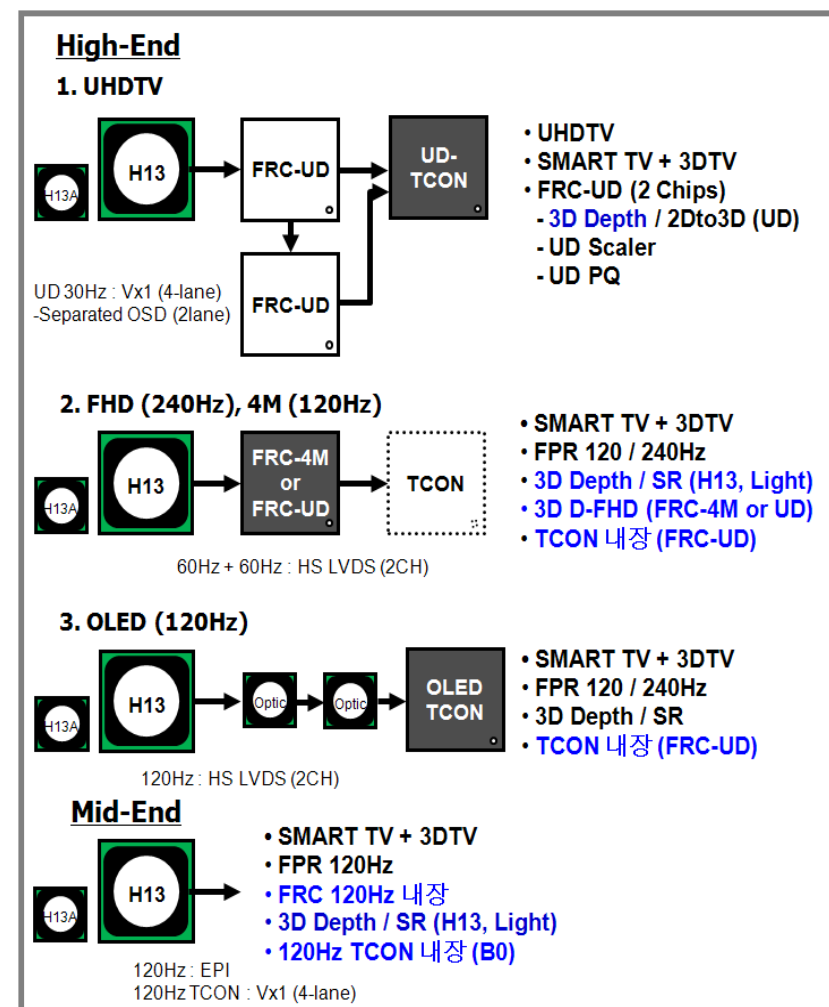
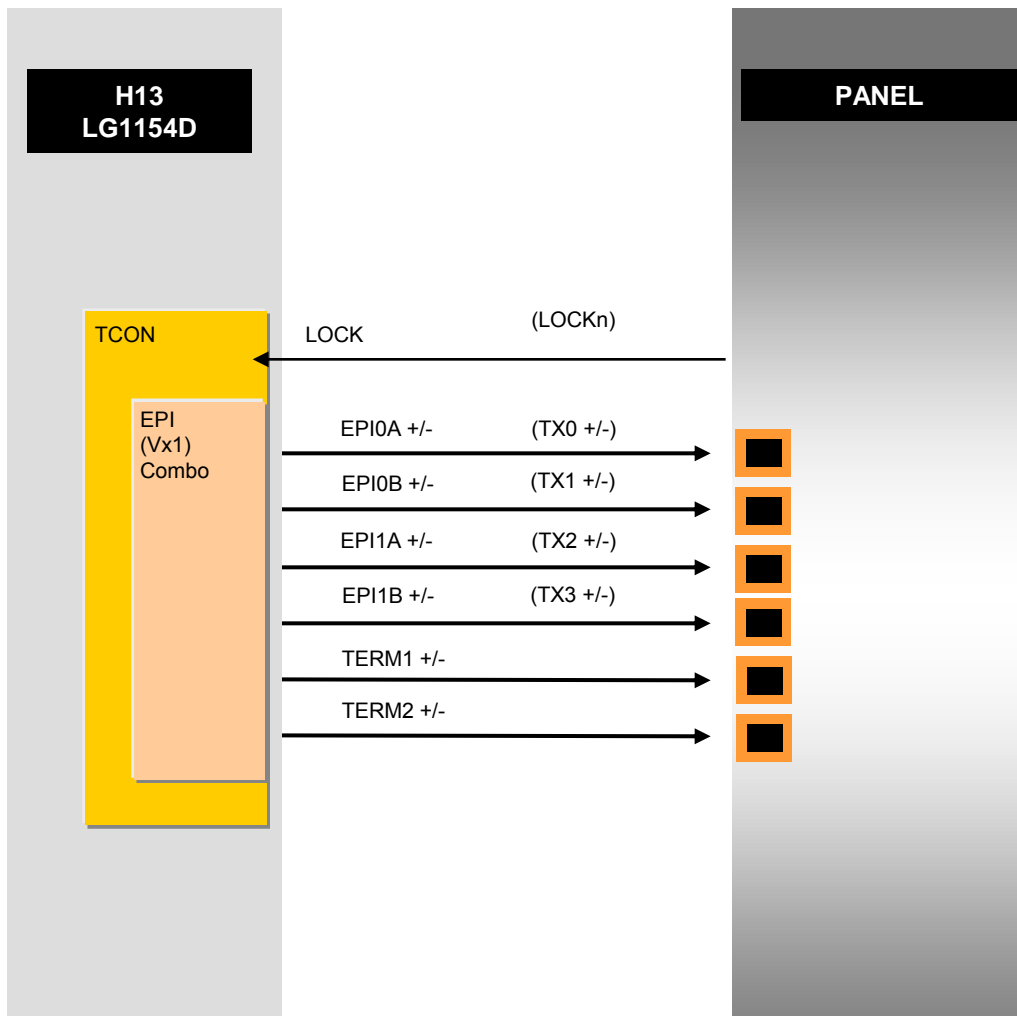


# H13 Block diagram

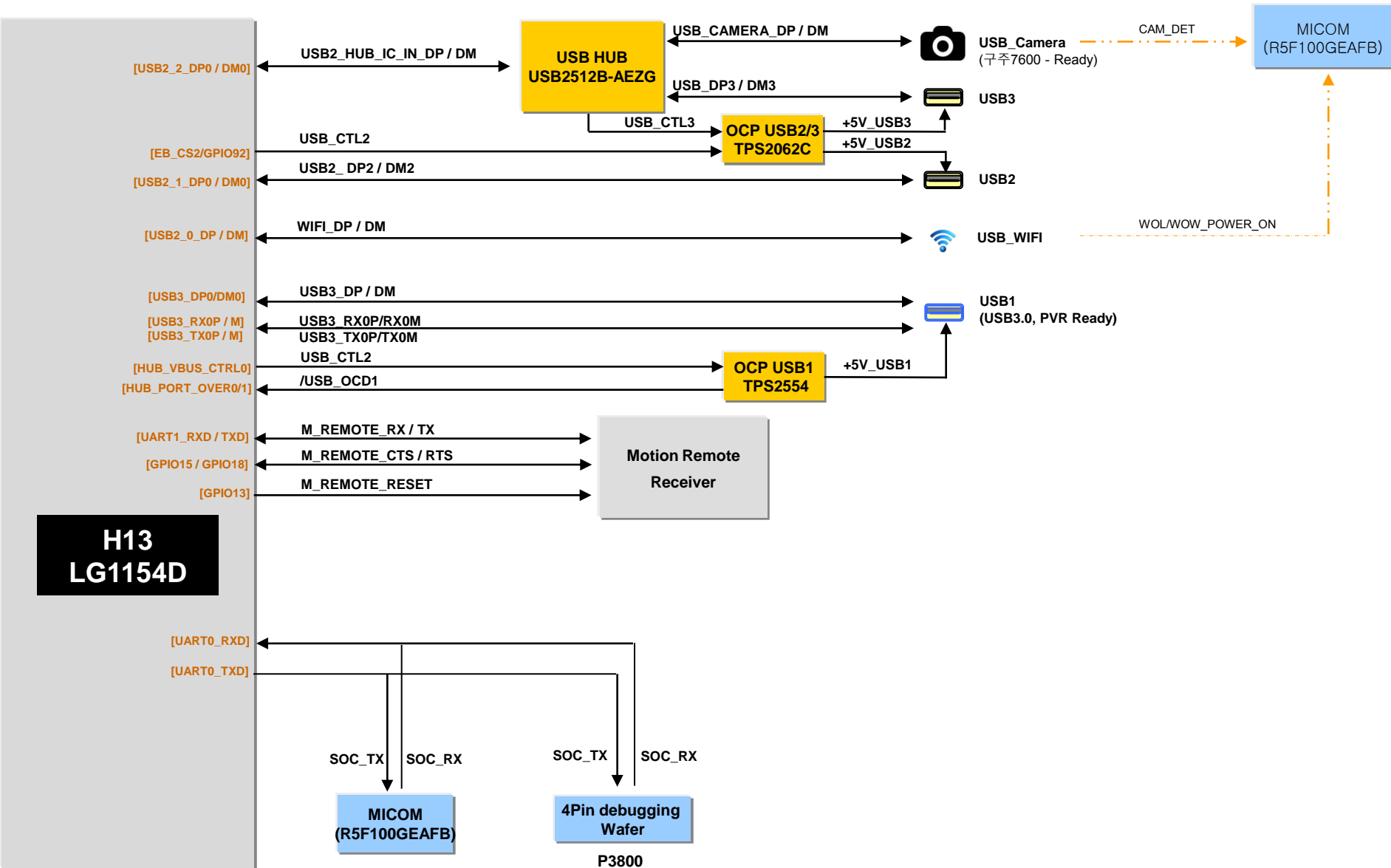




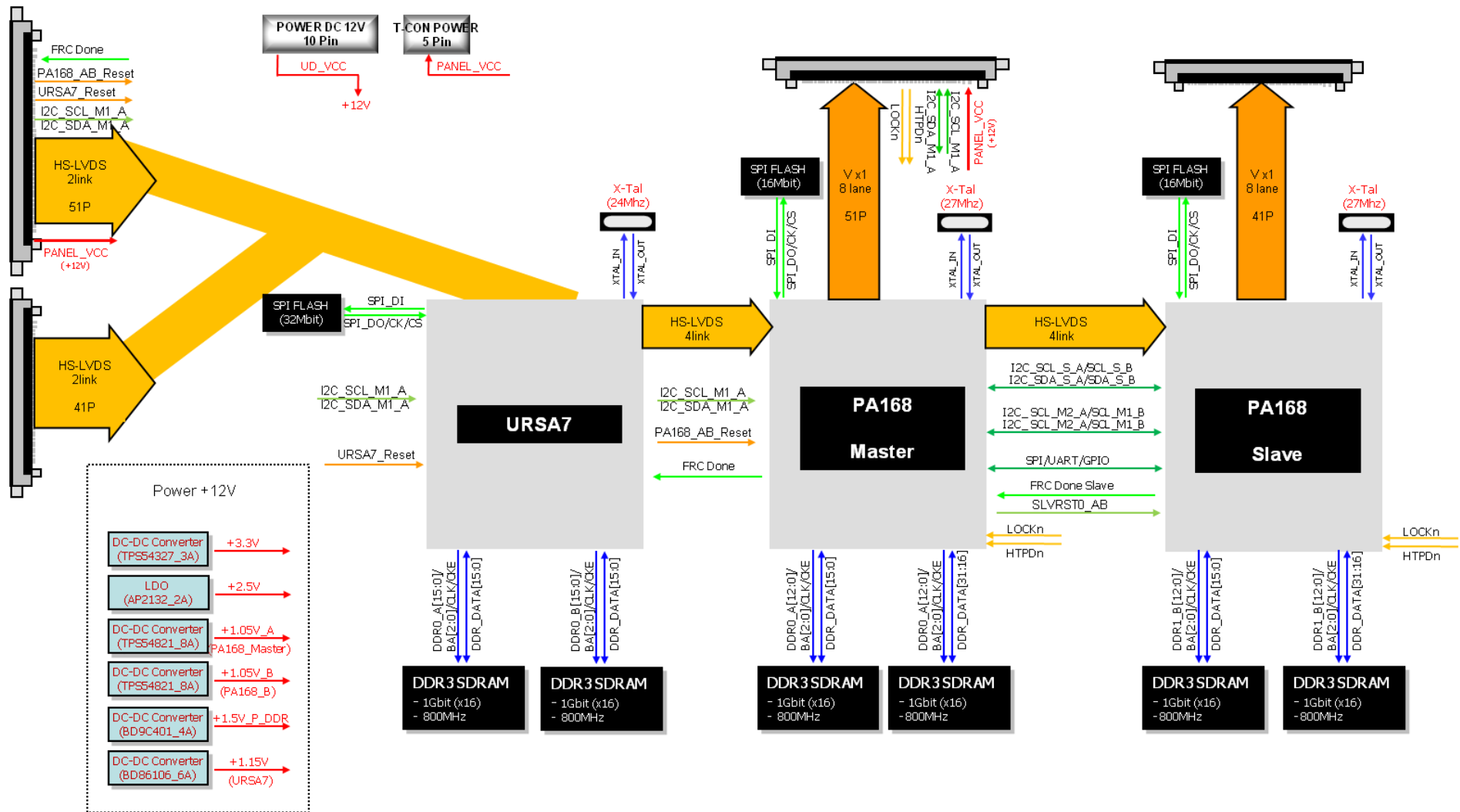
# Panel Interface (EPI)



# H13 Block diagram

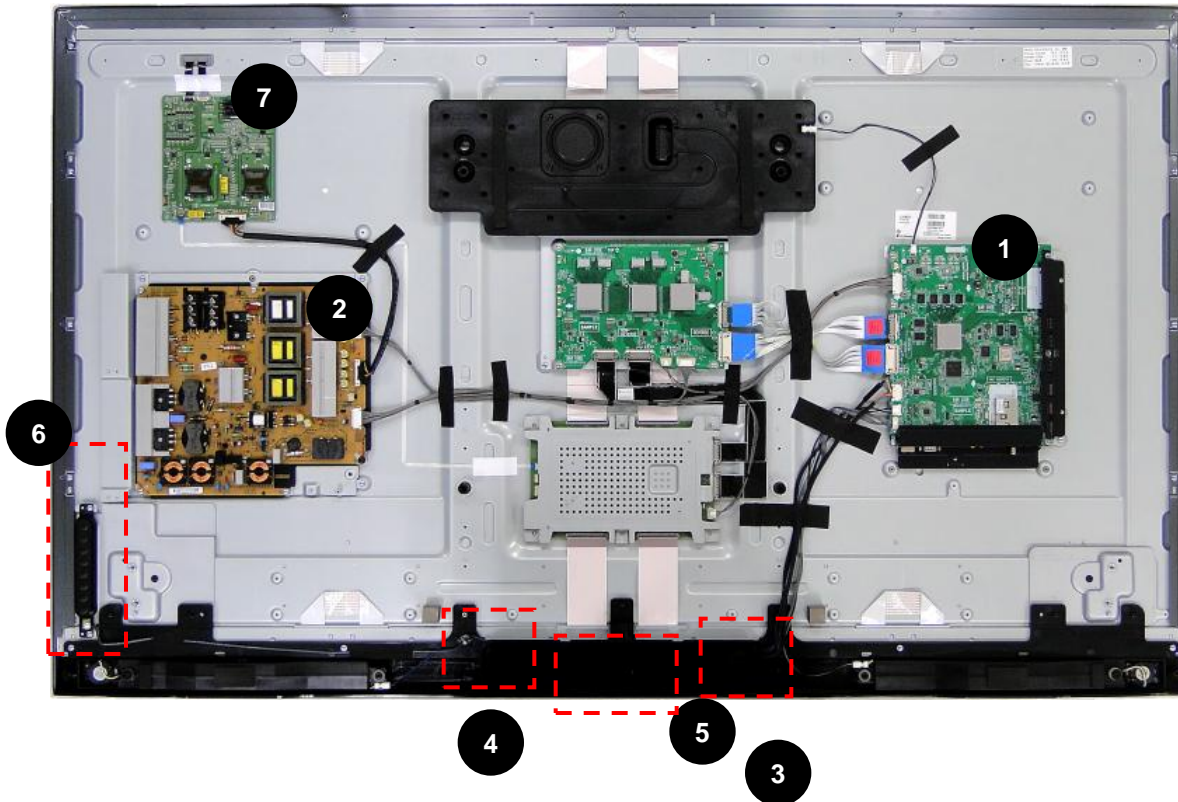


# FRC B/D (ULTRA HD) Block diagram



# Interconnection - 1

LA965\*-Z\*

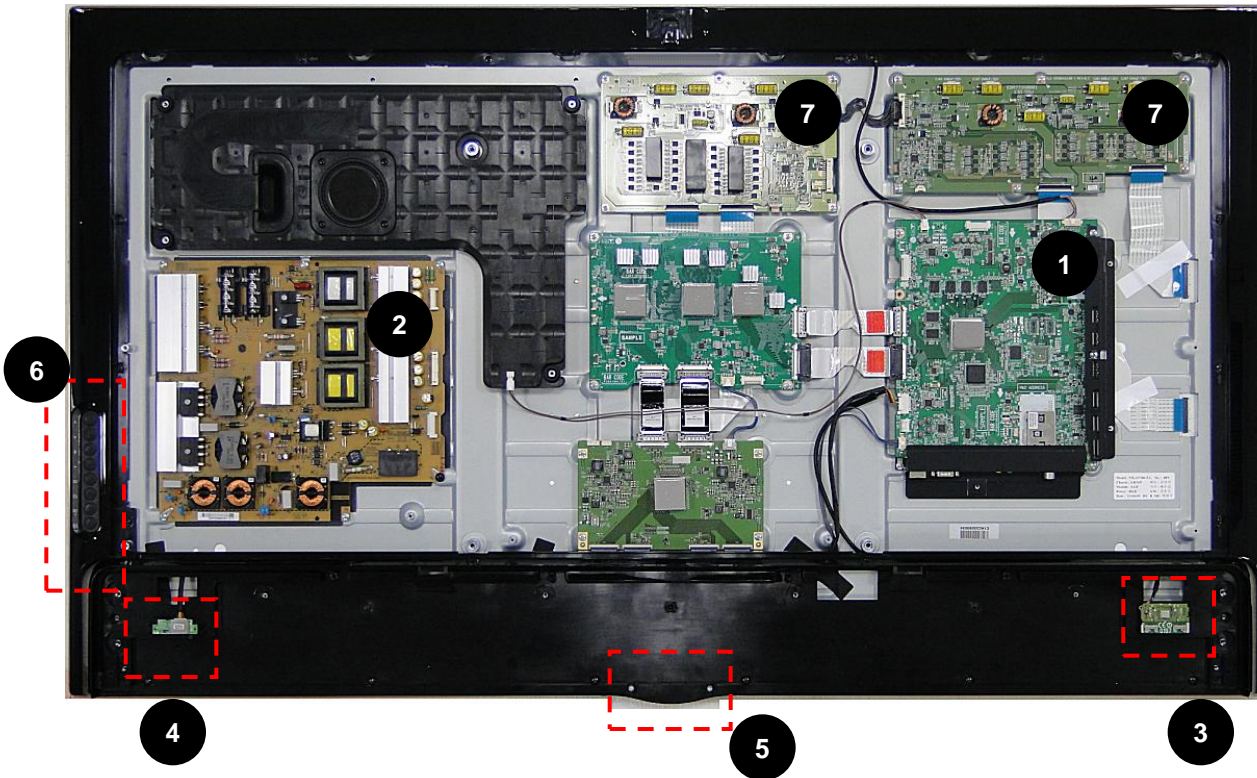


## [PCBs]

- 1 Main PCB
- 2 PSU
- 3 WIFI ASSY
- 4 BT MOTION ASSY
- 5 IR PCB
- 6 Local Key
- 7 LED Driver

# Interconnection - 1

LA970\*-Z\*



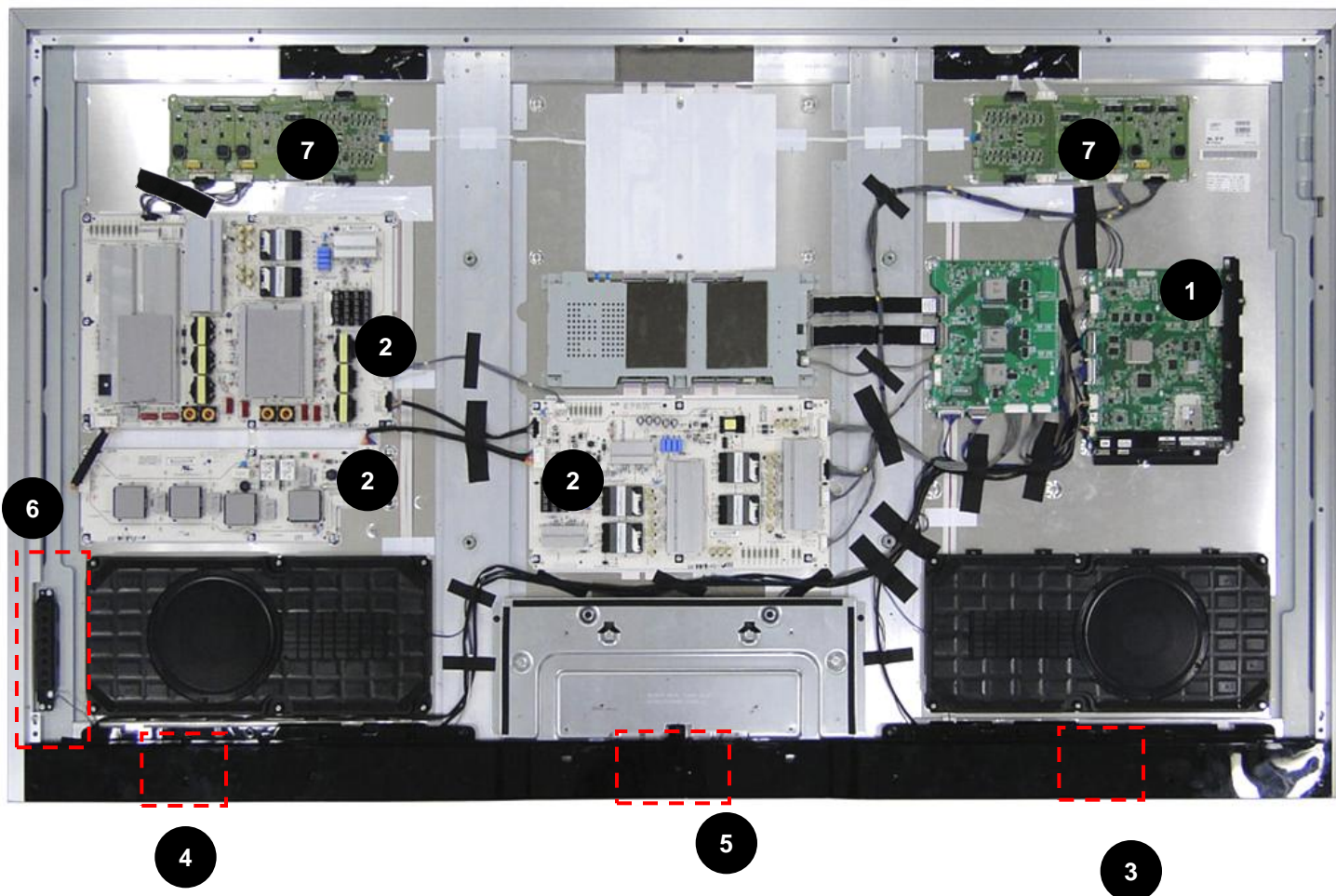
## [PCBs]

- 1 Main PCB
- 2 PSU
- 3 WIFI ASSY
- 4 BT MOTION ASSY
- 5 IR PCB
- 6 Local Key
- 7 LED Driver



# Interconnection - 1

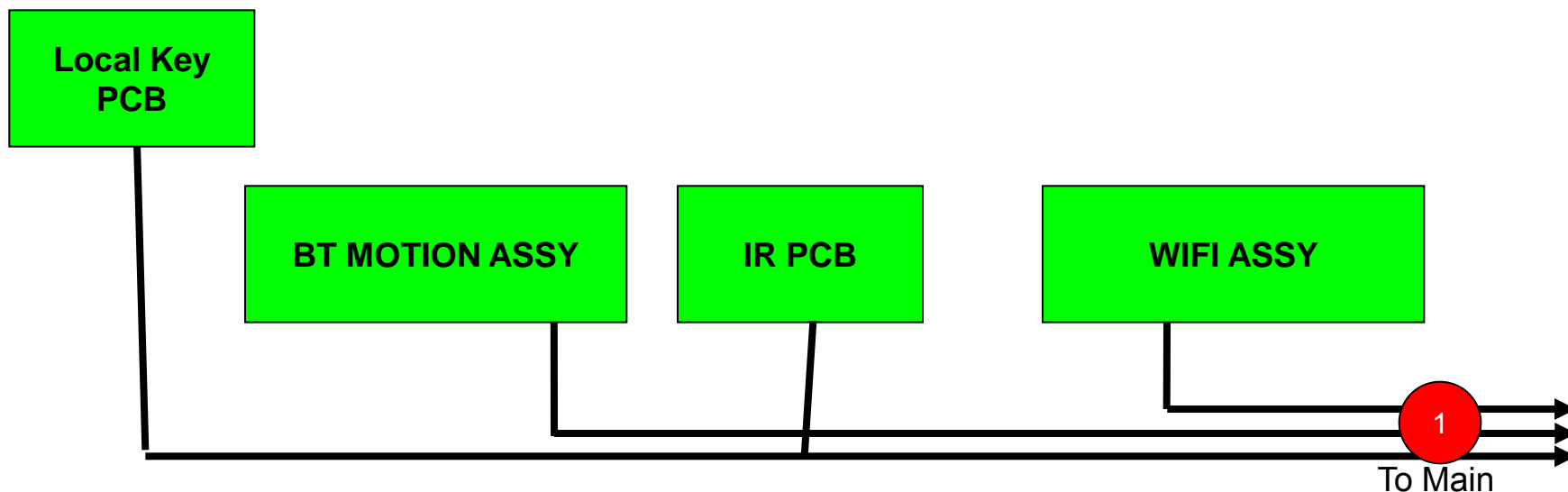
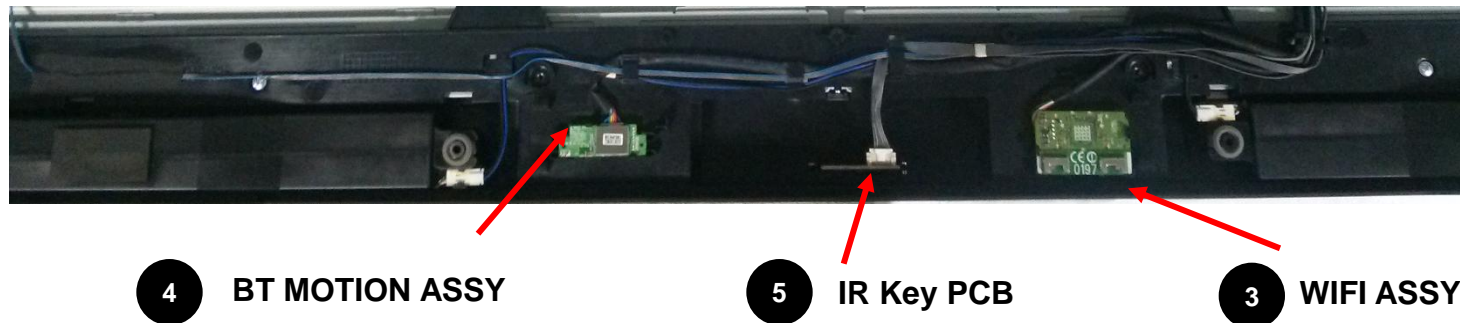
## 84LM96/LA980V-ZD



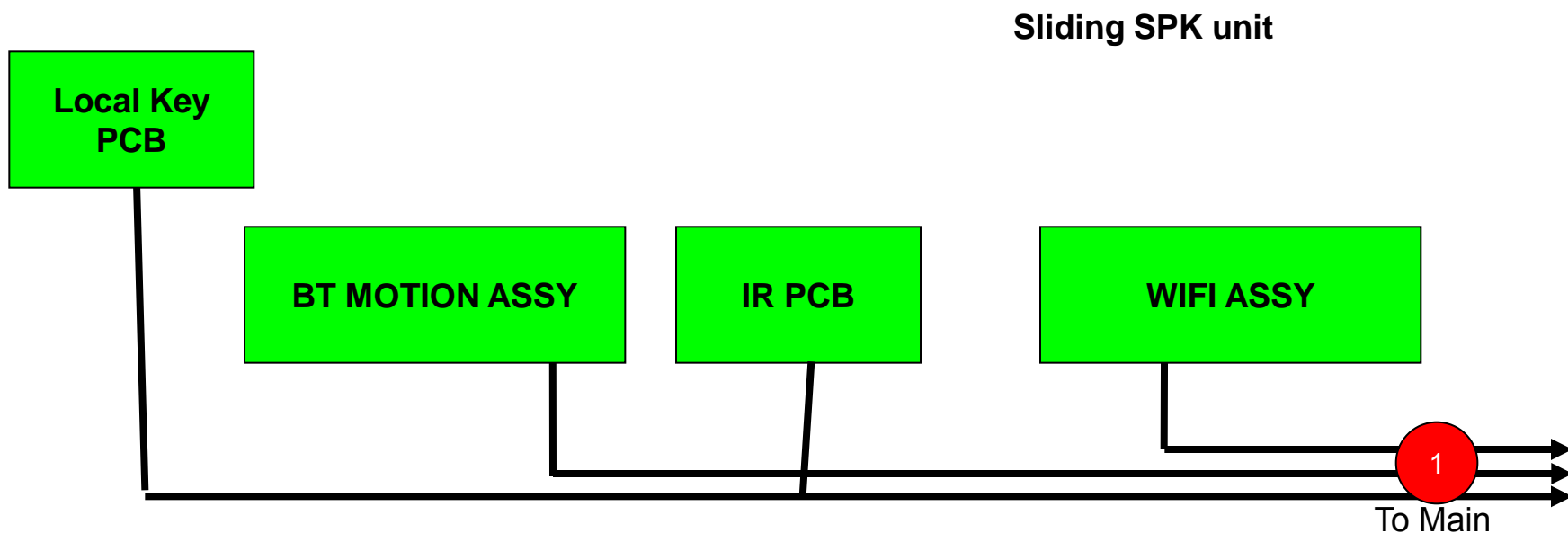
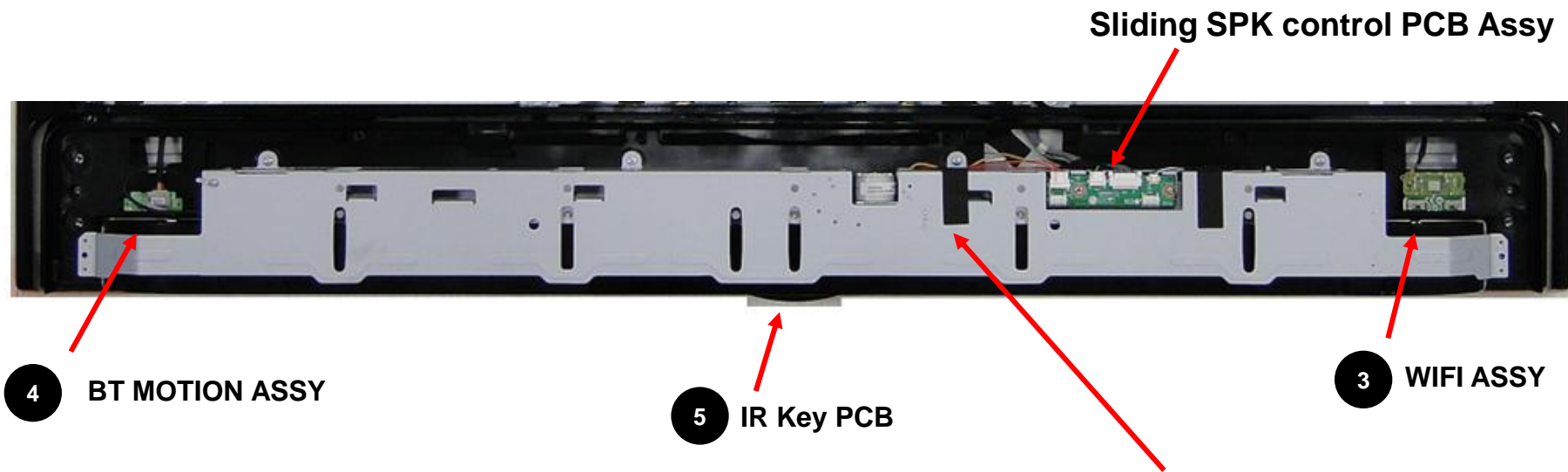
### [PCBs]

- 1 Main PCB
- 2 PSU
- 3 WIFI ASSY
- 4 BT MOTION ASSY
- 5 IR/LOGO PCB
- 6 Local Key
- 7 LED Driver

# Interconnection – sub PCB( \*\*LA965V Series )



# Interconnection – sub PCB( \*\*LA970\* Series )





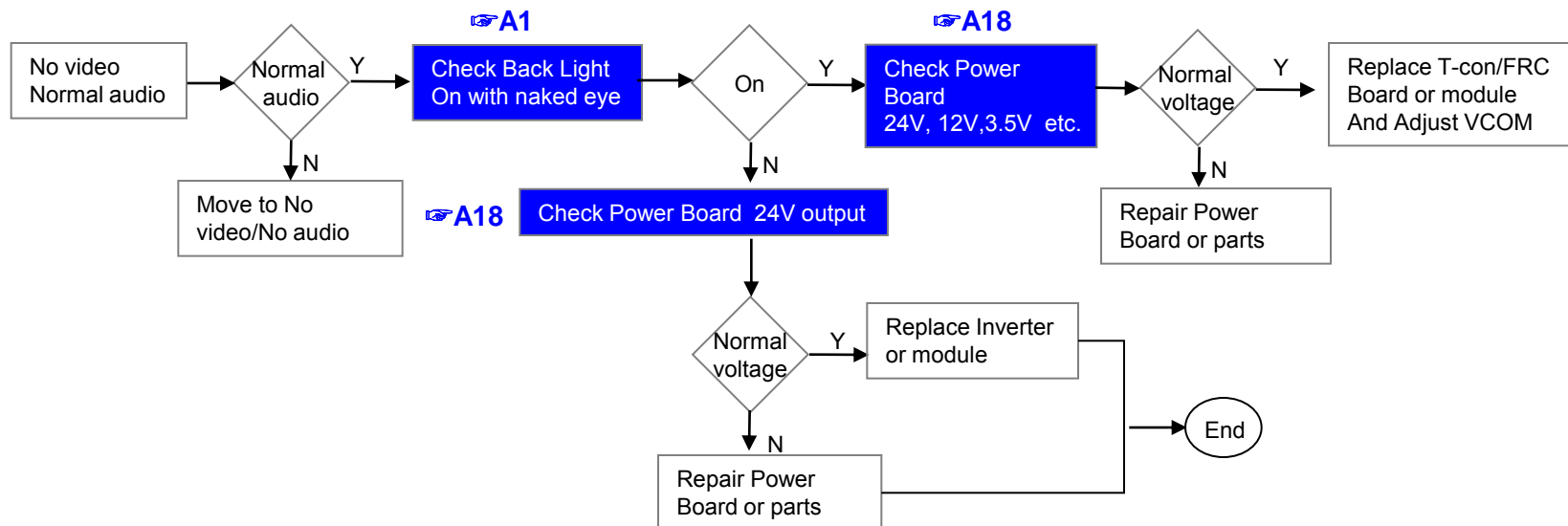
# Contents of LCD TV Standard Repair Process

No.	Error symptom (High category)	Error symptom (Mid category)	Page	Remarks
1	A. Video error	No video/Normal audio	1	
2		No video/No audio	2	
3		Picture broken/ Freezing	3	
4		Color error	4	
5		Vertical/Horizontal bar, residual image, light spot, external device color error	5	
6	B. Power error	No power	6	
7		Off when on, off while viewing, power auto on/off	7	
8	C. Audio error	No audio/Normal video	8	
9		Wrecked audio/discontinuation/noise	9	
10	D. Function error	Remote control & Local switch checking	10	
11		MR13 operating checking	11	
12		Wifi operating checking	12	
13		Camera operating checking	13	
14		External device recognition error	14	
15	E. Noise	Circuit noise, mechanical noise	15	
16	F. Exterior error	Exterior defect	16	

**First of all, Check whether there is SVC Bulletin in GCSC System for these model.**

LCD TV	Error symptom	A. Video error	Established date	2013.01.31	
		No video/ Normal audio	Revised date		1/16

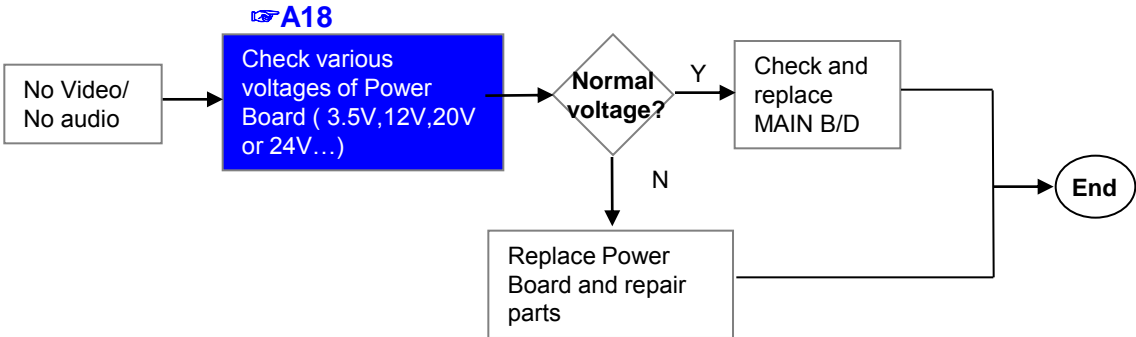
**First of all, Check whether all of cables between board is inserted properly or not.  
(Main B/D↔ Power B/D, LVDS Cable,Speaker Cable,IR B/D Cable,,)**



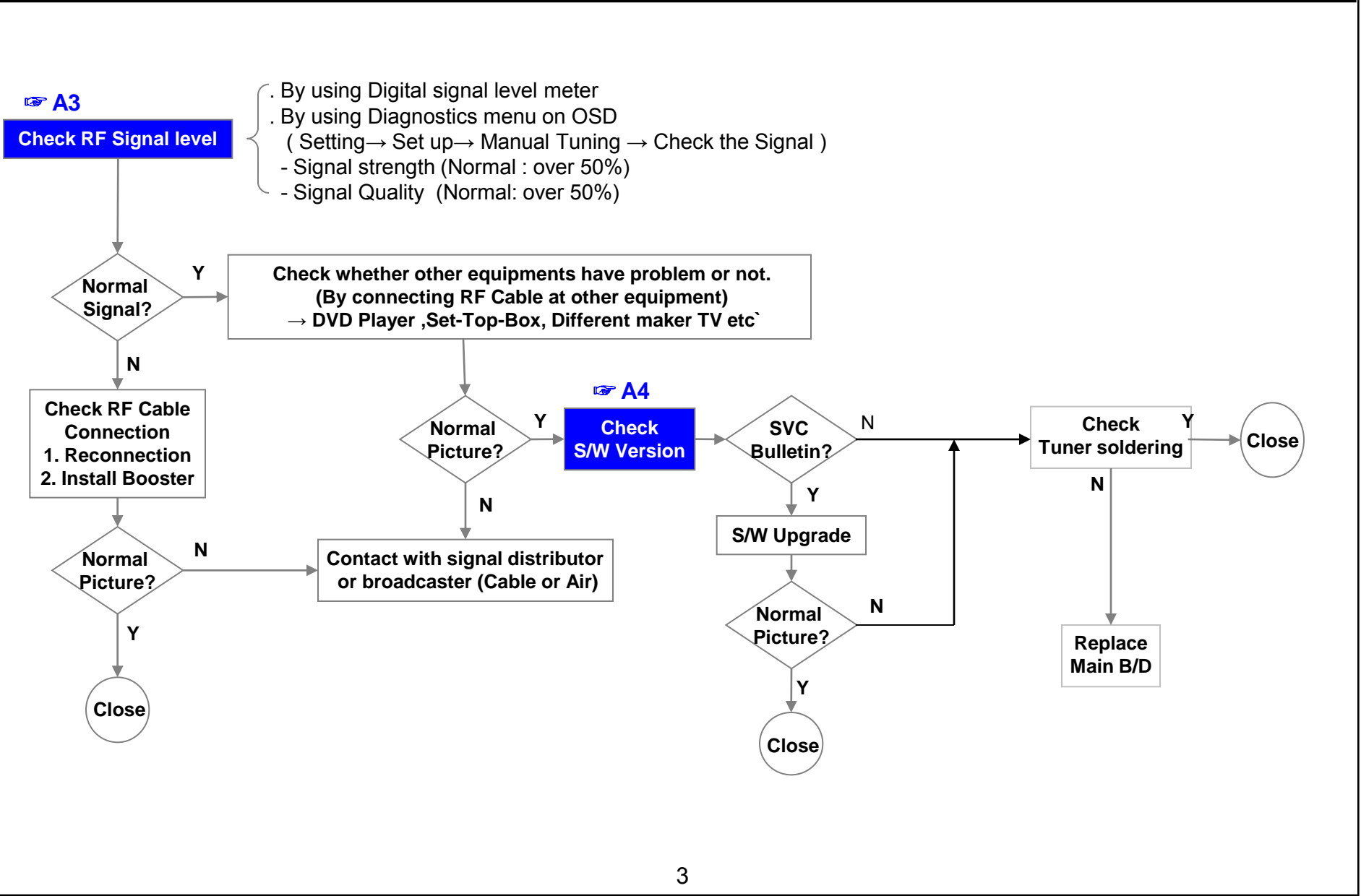
※Precaution A4 & A2



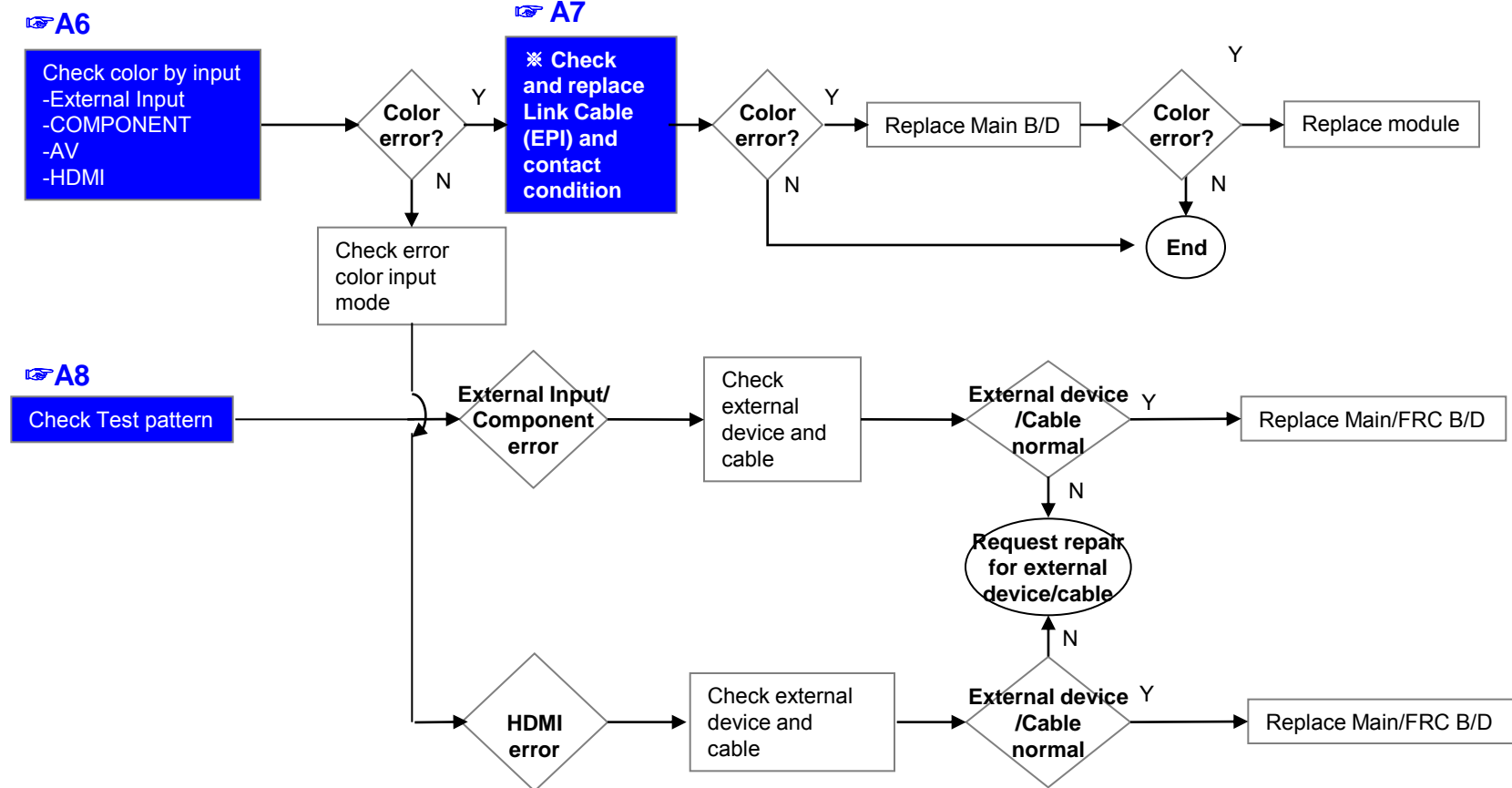
LCD TV	Error symptom	A. Video error	Established date	2013.01.31	
		No video/ No audio	Revised date		2/16



LCD TV	Error symptom	A. Video error	Established date	2013.01.31	
		Picture broken/ Freezing	Revised date		3/16



LCD TV	Error symptom	A. Video error	Established date	2013.01.31	
		Color error	Revised date		4/16



LCD TV	Error symptom	A. Video error	Established date	2013.01.31	
		Vertical / Horizontal bar, residual image, light spot, external device color error	Revised date		5/16

## Vertical/Horizontal bar, residual image, light spot

### A6

Check color condition by input

- External Input
- Component
- HDMI

Screen normal?

Y  
N

Replace module

Check external device connection condition

Normal?

Y  
N

Request repair for external device

### A7

Check and replace Link Cable

Screen normal?

Y  
N

End

Replace Main/FRC B/D (adjust VCOM)

For LGD panel

Replace Main B/D

For other panel

Screen normal?

Y  
N

End

Replace Module

### A8

Check Test pattern

## External device screen error-Color error

Check S/W Version

Check version

Y  
N

S/W Upgrade

Normal screen?

Y  
N

End

Check screen condition by input  
-External Input  
-Component  
-HDMI/DVI

External Input error

Component error

HDMI/DVI

Connect other external device and cable  
(Check normal operation of External Input, Component, RGB and HDMI/DVI by connecting Jig, pattern Generator, Set-top Box etc.)

Screen normal?

Y  
N

Replace Main/FRC B/D

Request repair for external device

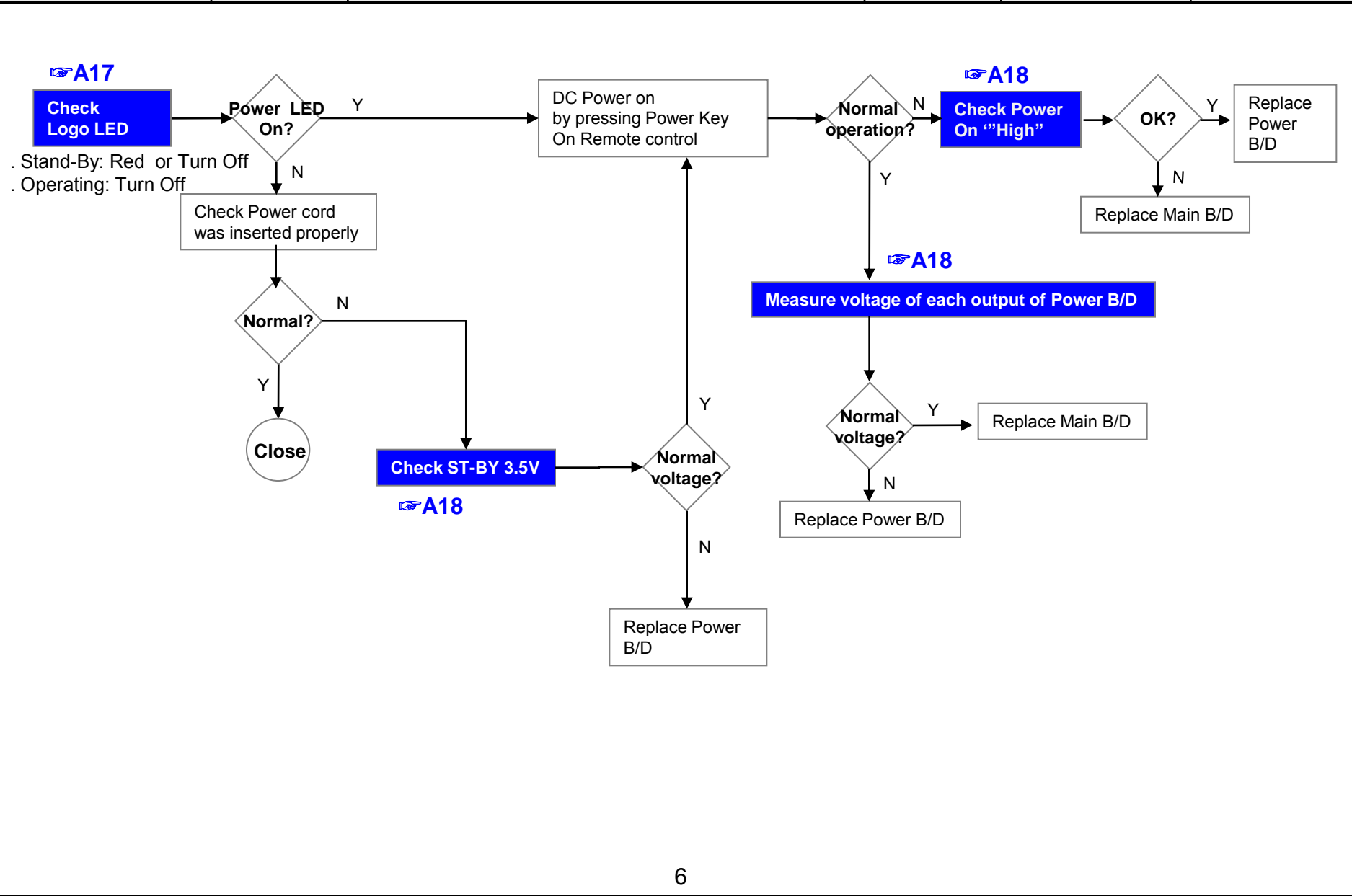
Screen normal?

Y  
N

Replace Main /FRC B/D

Connect other external device and cable  
(Check normal operation of External Input, Component, RGB and HDMI/DVI by connecting Jig, pattern Generator, Set-top Box etc.)

LCD TV	Error symptom	B. Power error	Established date	2013.01.31	
		No power	Revised date		6/16



## LCD TV

Error  
symptom

## B. Power error

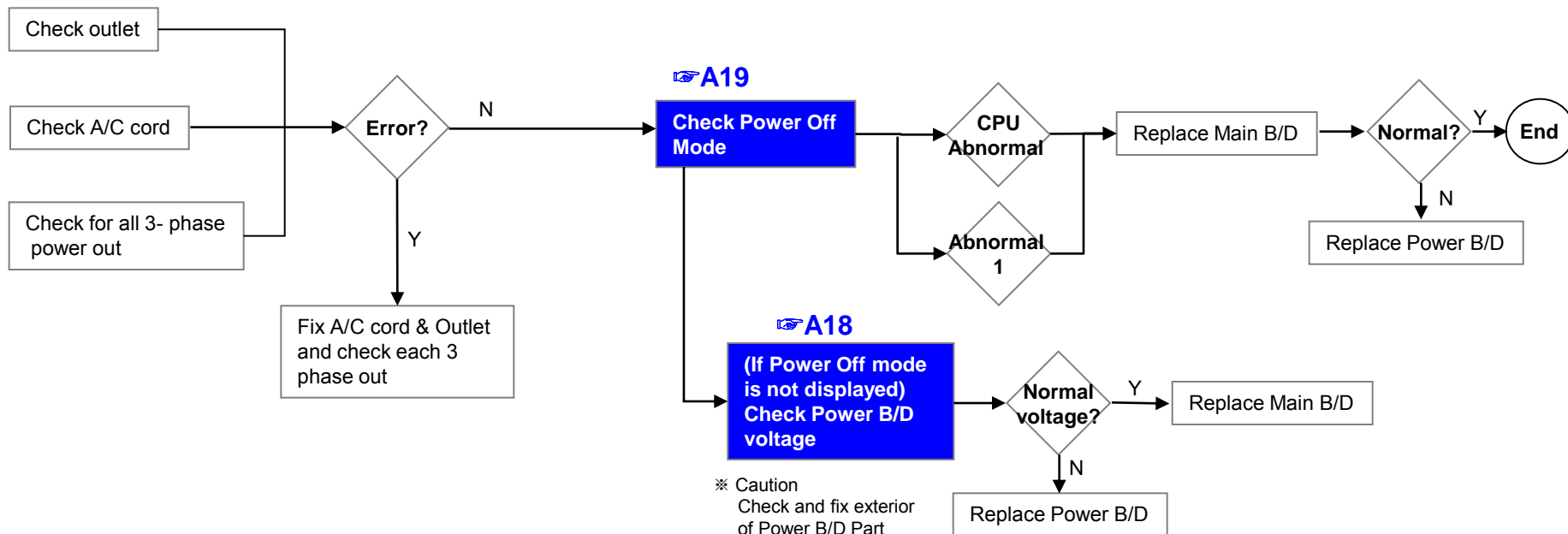
Established  
date

2013.01.31

Off when on, off while viewing, power auto on/off

Revised date

7/16

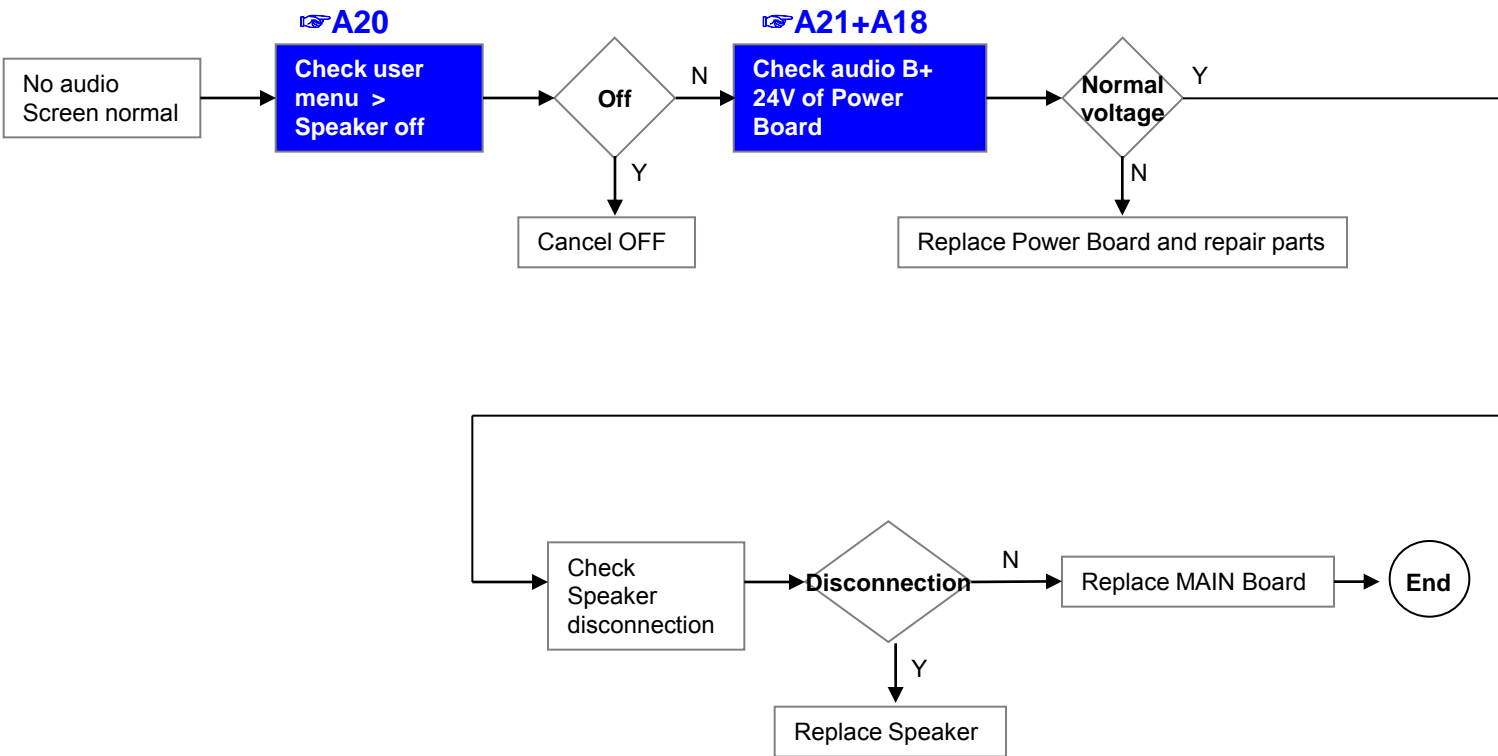


\* Please refer to the all cases which can be displayed on power off mode.

Status	Power off List	Explanation
Normal	"POWEROFF_REMOTEKEY"	Power off by REMOTE CONTROL
	"POWEROFF_OFFTIMER"	Power off by OFF TIMER
	"POWEROFF_SLEEPTIMER"	Power off by SLEEP TIMER
	"POWEROFF_INSTOP"	Power off by INSTOP KEY
	"POWEROFF_AUTOOFF"	Power off by AUTO OFF
	"POWEROFF_ONTIMER"	Power off by ON TIMER
	"POWEROFF_RS232C"	Power off by RS232C
	"POWEROFF_RESREC"	Power off by Reserved Record
	"POWEROFF_RECEND"	Power off by End of Recording
	"POWEROFF_SWDOWN"	Power off by S/W Download
Abnormal	"POWEROFF_UNKNOWN"	Power off by unknown status except listed case
	"POWEROFF_ABNORMAL1"	Power off by abnormal status except CPU trouble
	"POWEROFF_CPUABNORMAL"	Power off by CPU Abnormal



LCD TV	Error symptom	C. Audio error	Established date	2013.01.31	
		No audio/ Normal video	Revised date		8/16



LCD TV

Error  
symptom

C. Audio error

Established  
date

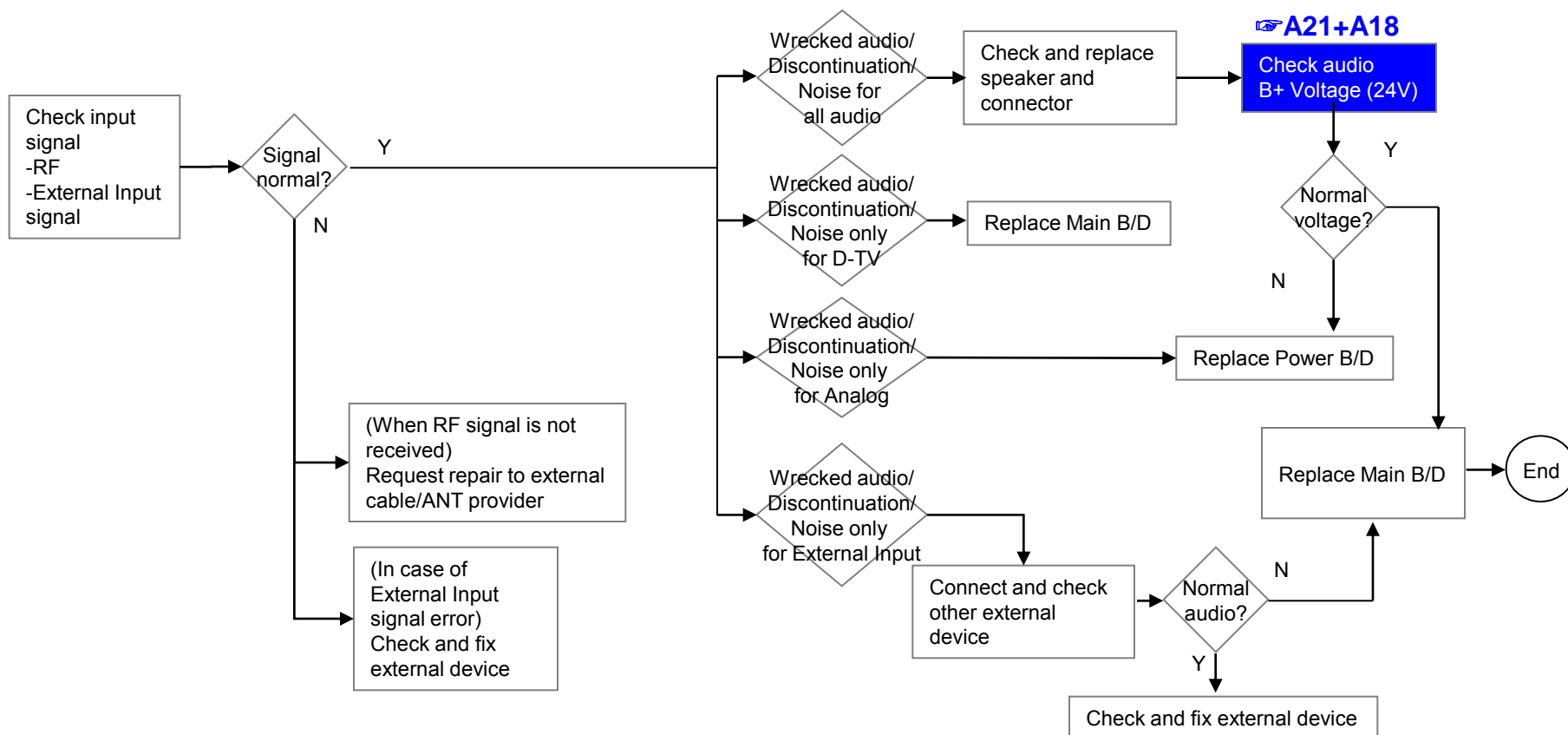
2013.01.31

Wrecked audio/ discontinuation/noise

Revised date

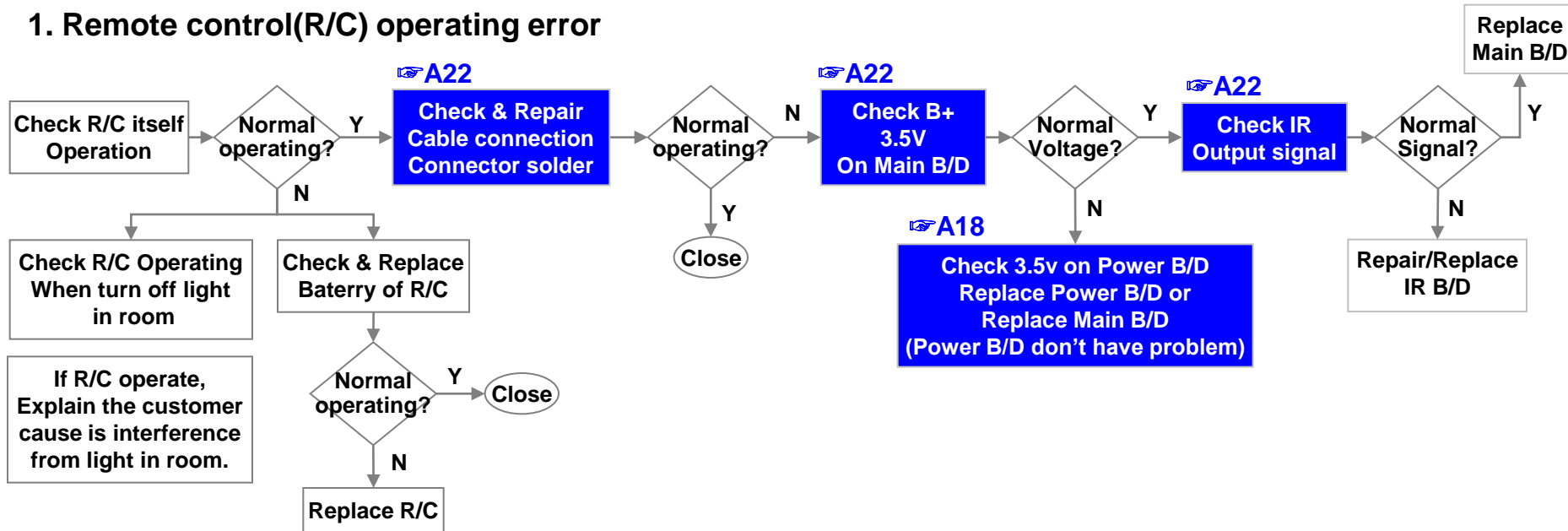
9/16

→ abnormal audio/discontinuation/noise is same after “Check input signal” compared to No audio



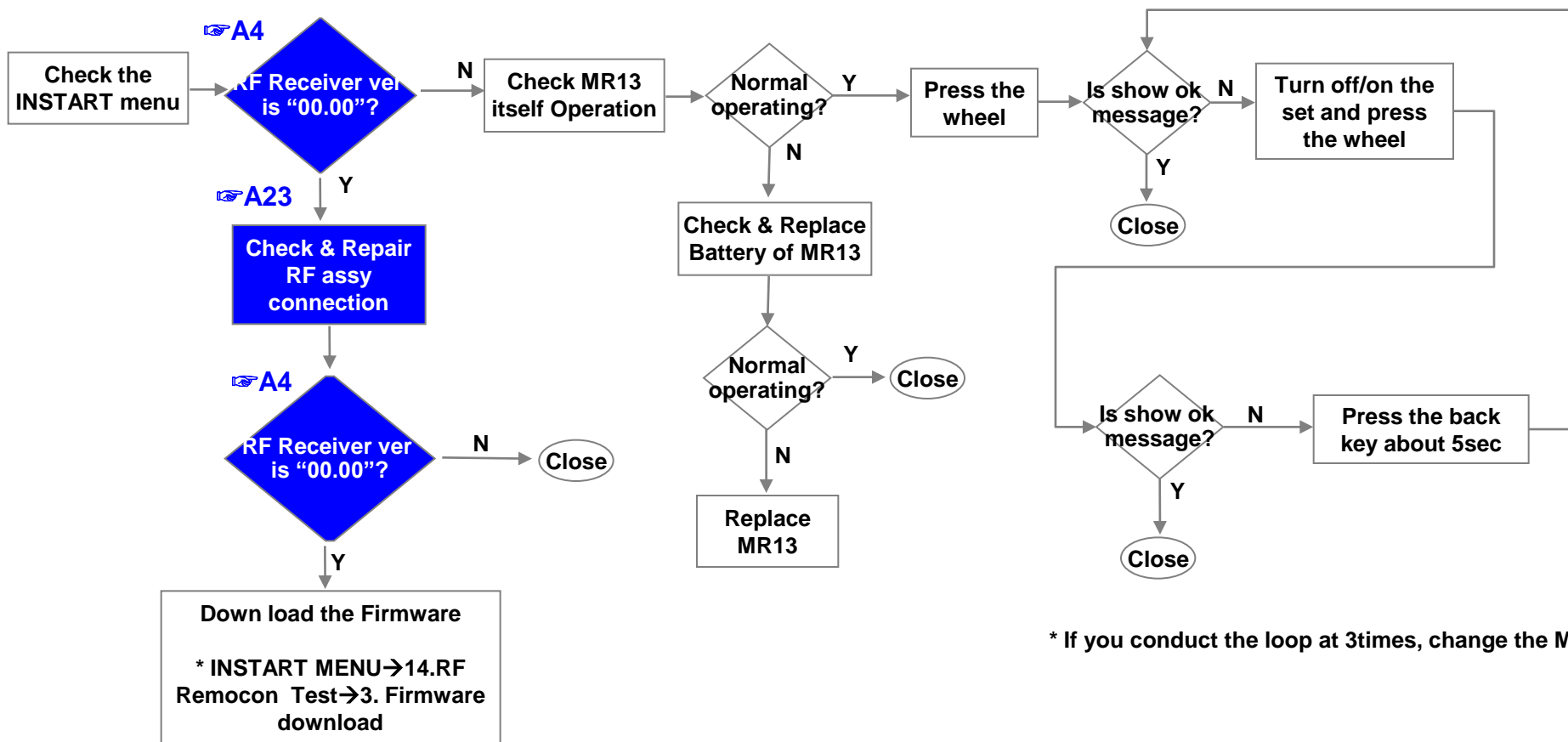
LCD TV	Error symptom	D. Function error	Established date	2013.01.31	
		Remote control & Local switch checking	Revised date		10/16

## 1. Remote control(R/C) operating error



LCD TV	Error symptom	D. Function error	Established date	2013.01.31	
		MR13 operating checking	Revised date		11/16

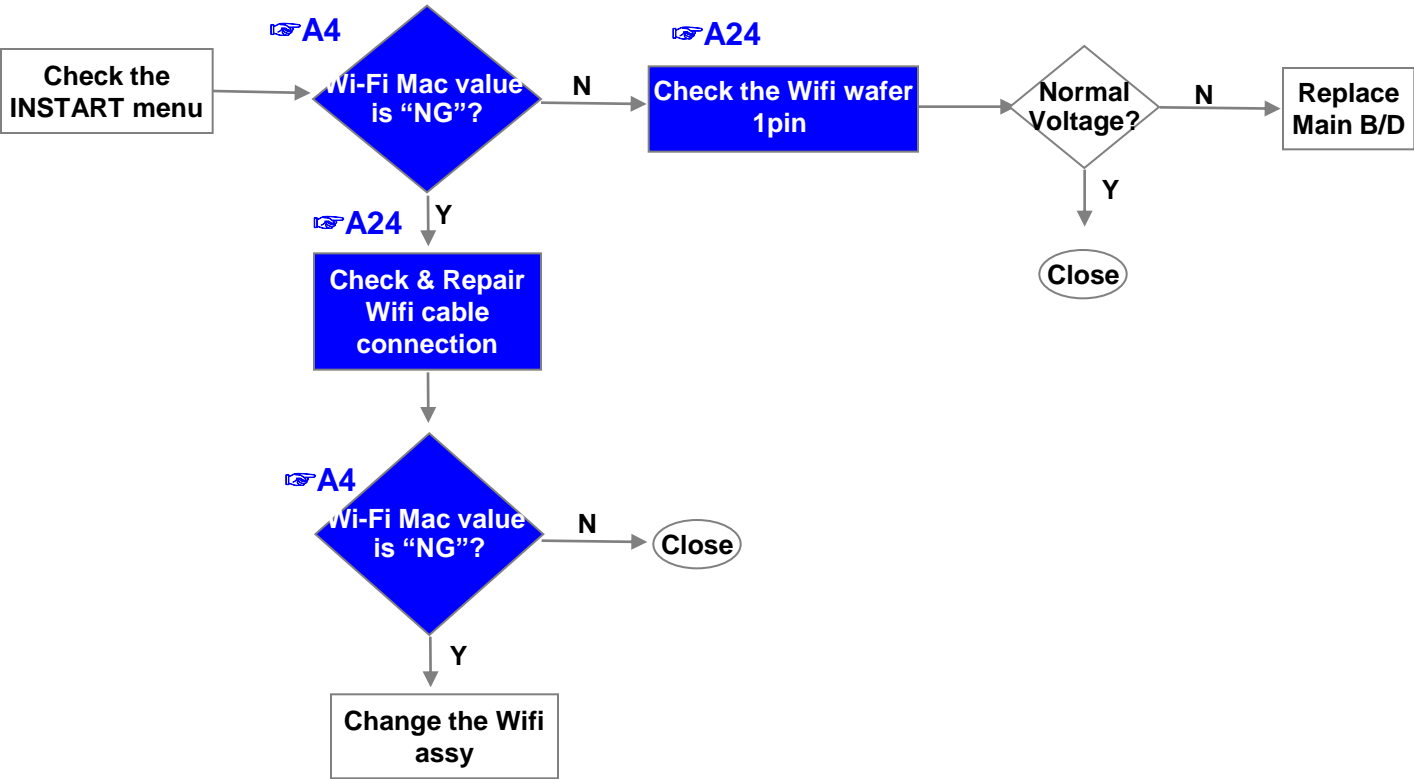
## 2. MR13(Magic Remocon) operating error



\* If you conduct the loop at 3times, change the M4.

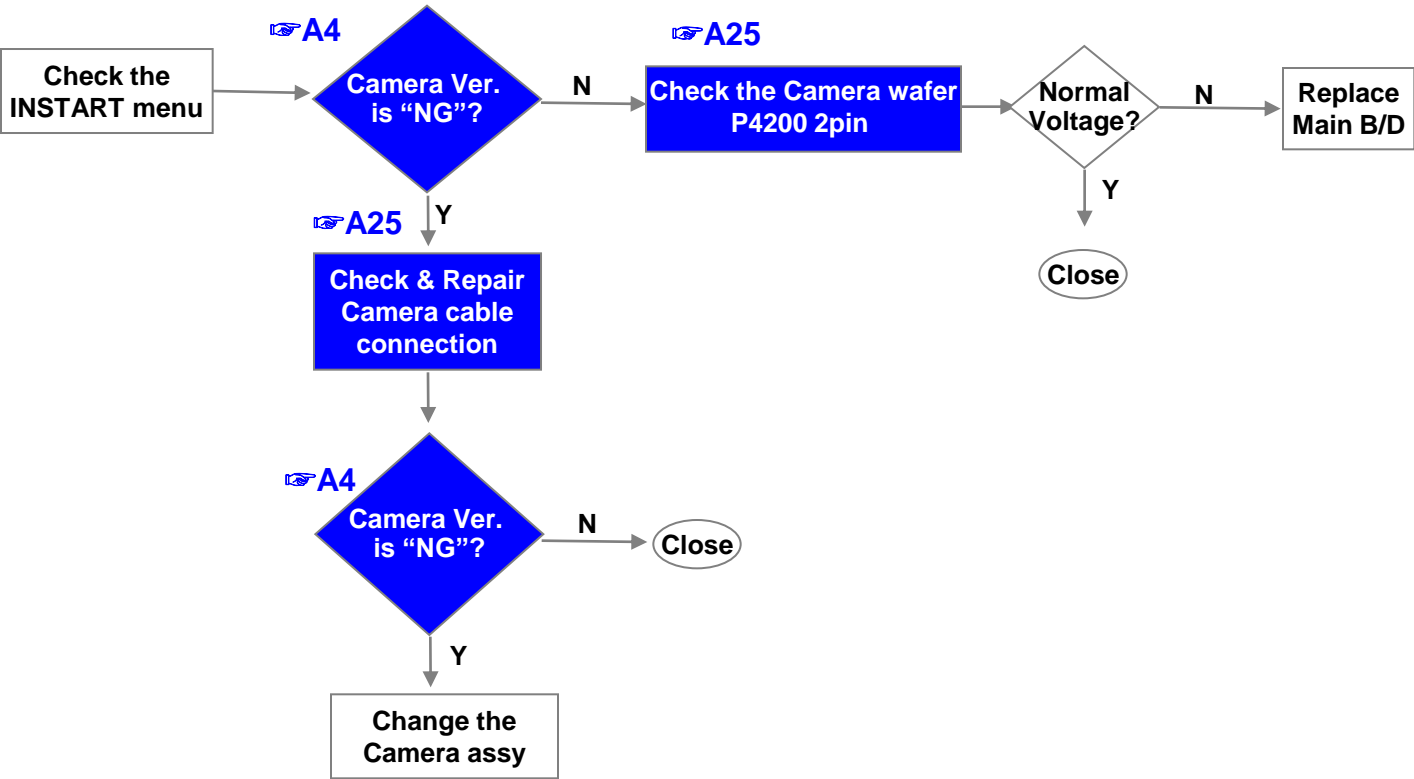
LCD TV	Error symptom	D. Function error	Established date	2013.01.31	
		Wifi operating checking	Revised date		12/16

### 3.Wifi operating error

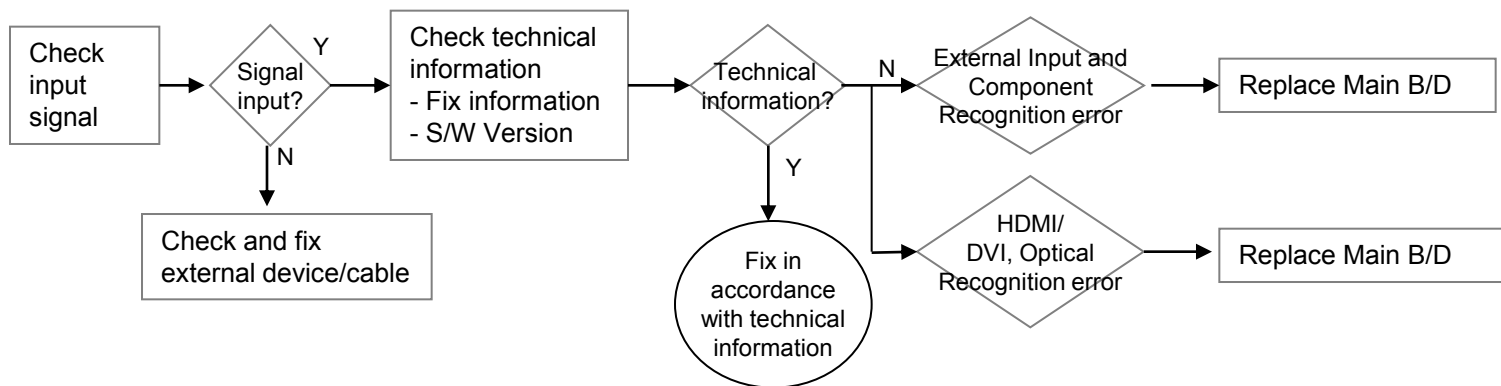


LCD TV	Error symptom	D. Function error	Established date	2013.01.31	
		Camera operating checking	Revised date		13/16

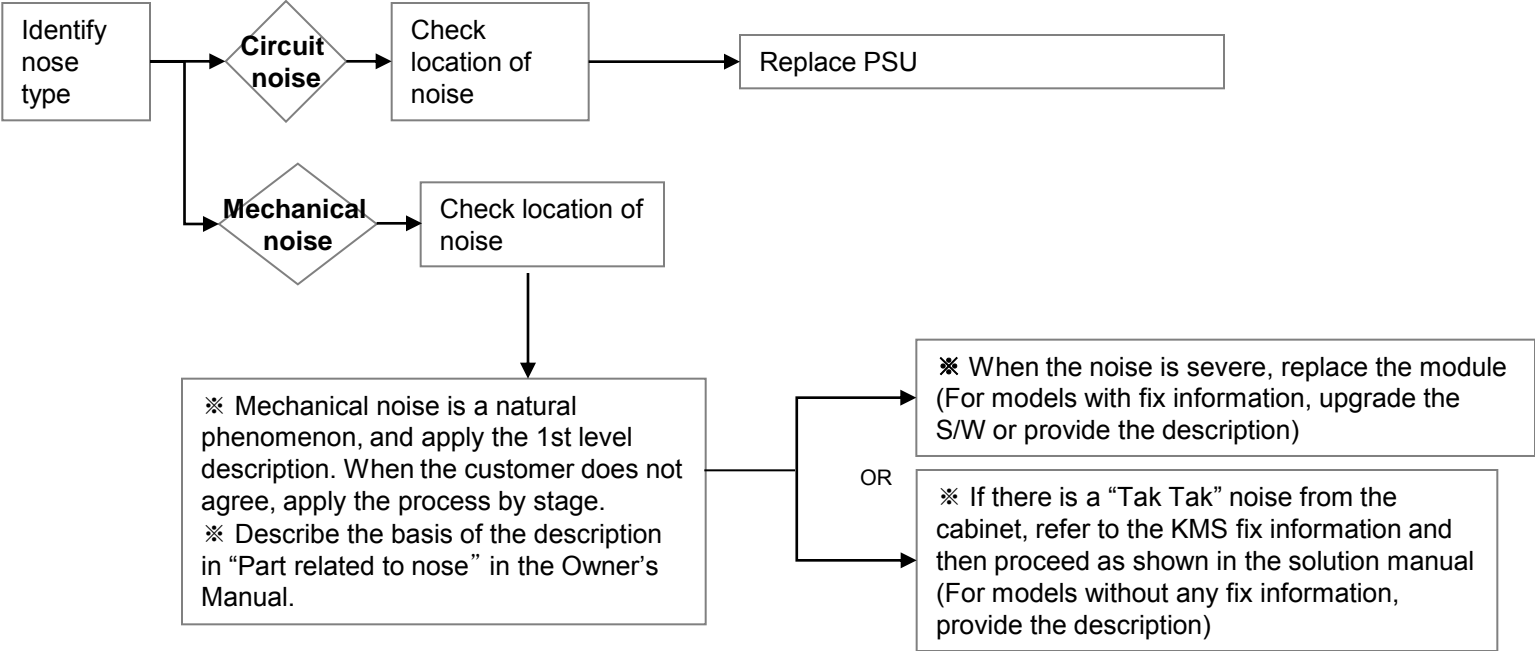
### 4.Camera operating error



LCD TV	Error symptom	D. Function error	Established date	2013.01.31	
		External device recognition error	Revised date		14/16

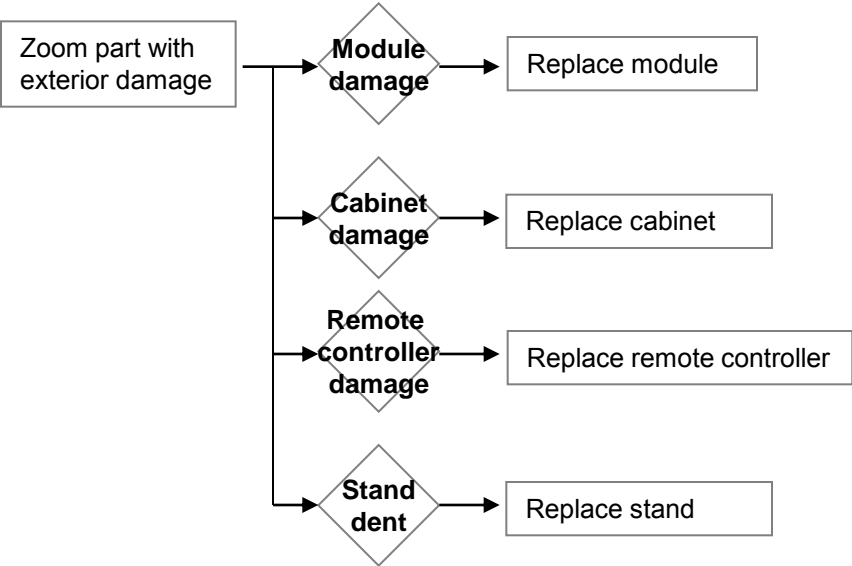


LCD TV	Error symptom	E. Noise	Established date	2013.01.31	
		Circuit noise, mechanical noise	Revised date		15/16





LCD TV	Error symptom	F. Exterior defect	Established date	2013.01.31	
		Exterior defect	Revised date		16/16



# Contents of LCD TV Standard Repair Process Detail Technical Manual

No.	Error symptom	Content	Page	Remarks
1	A. Video error_ No video/Normal audio	Check LCD back light with naked eye	A1-1, A1-2	
2		Check White Balance value	A2	
4	A. Video error_ video error /Video lag/stop	TUNER input signal strength checking method	A3	
5		LCD-TV Version checking method	A4	
6		Tuner Checking Part	A5	
7	A. Video error _Vertical/Horizontal bar, residual image, light spot	LCD TV connection diagram	A6	
8	A. Video error_ Color error	Check Link Cable (EPI) reconnection condition	A7-1 A7-2	
9		Adjustment Test pattern – ADJ Key	A8	
10	<b>&lt;Appendix&gt;</b> Defected Type caused by T-Con/ Inverter/ Module	Exchange Main Board (1)	A-1/5	
11		Exchange Main Board (2)	A-2/5	
12		Exchange Power Board (PSU)	A-3/5	
13		Exchange Module (1)	A-4/5	
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**Continue to the next page**

# Contents of LCD TV Standard Repair Process Detail Technical Manual

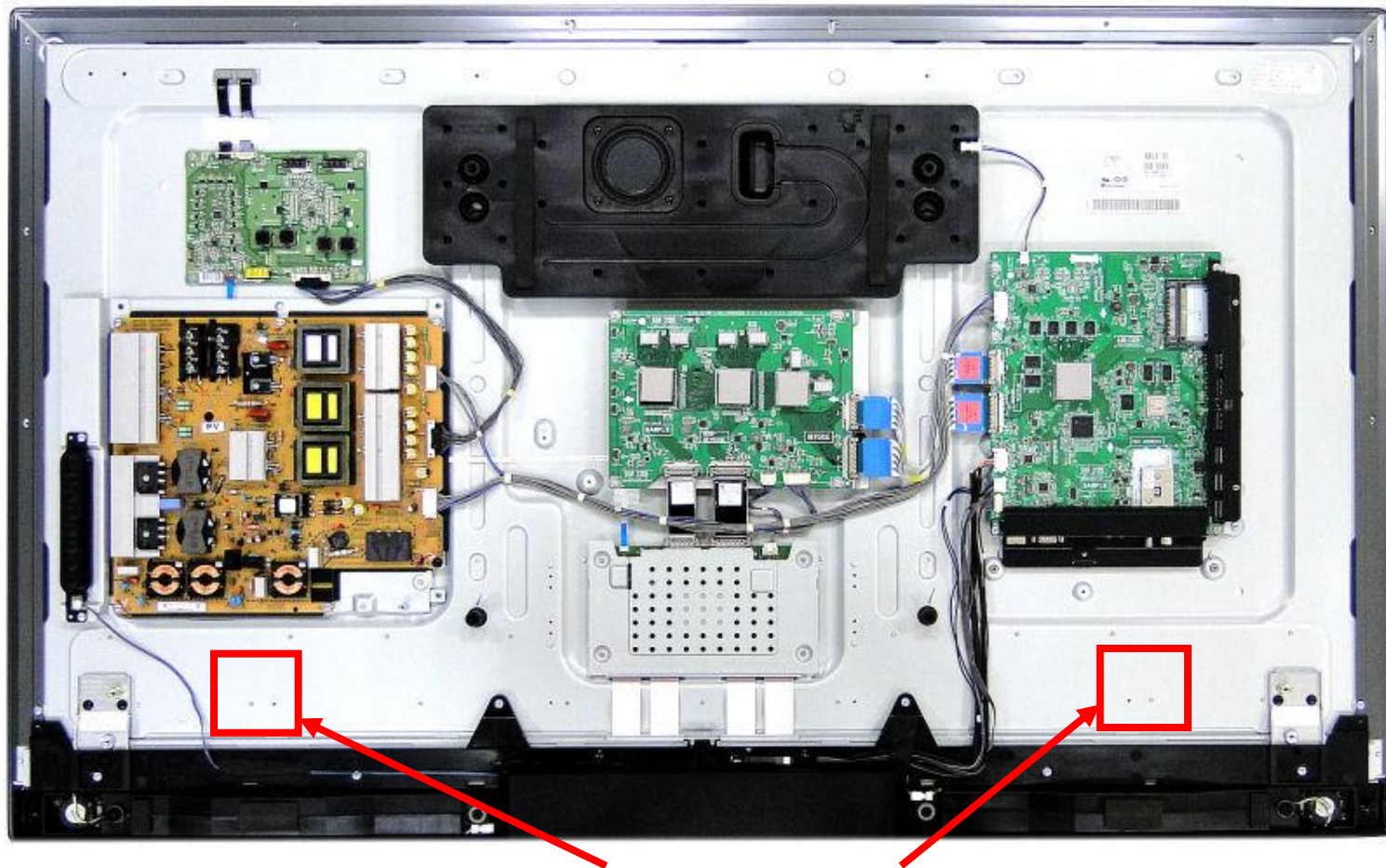
Continued from previous page

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16	B. Power error_ No power	Check front display LED	A17-1	
17		Check power input Voltage & ST-BY 3.5V	A17-2	
18	B. Power error_Off when on, off while viewing	POWER OFF MODE checking method	A18	
19	C. Audio error_ No audio/Normal video	CHECKING method in menu when there is no audio	A19	
20		Voltage and speaker checking method when there is no audio	A20	
21	D. Function error	Remote controller operation checking method	A21	
22		Motion Remote operation checking method	A22	
23		Wifi operation checking method	A23	
24		Camera operation checking method	A24	
25	E. Etc	Tool option changing method	A25	
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# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/Normal audio	Established date	2013.01.31	
	Content	Check LCD back light with naked eye	Revised date		A1-1

< \*\*LA965\*-Z\* >



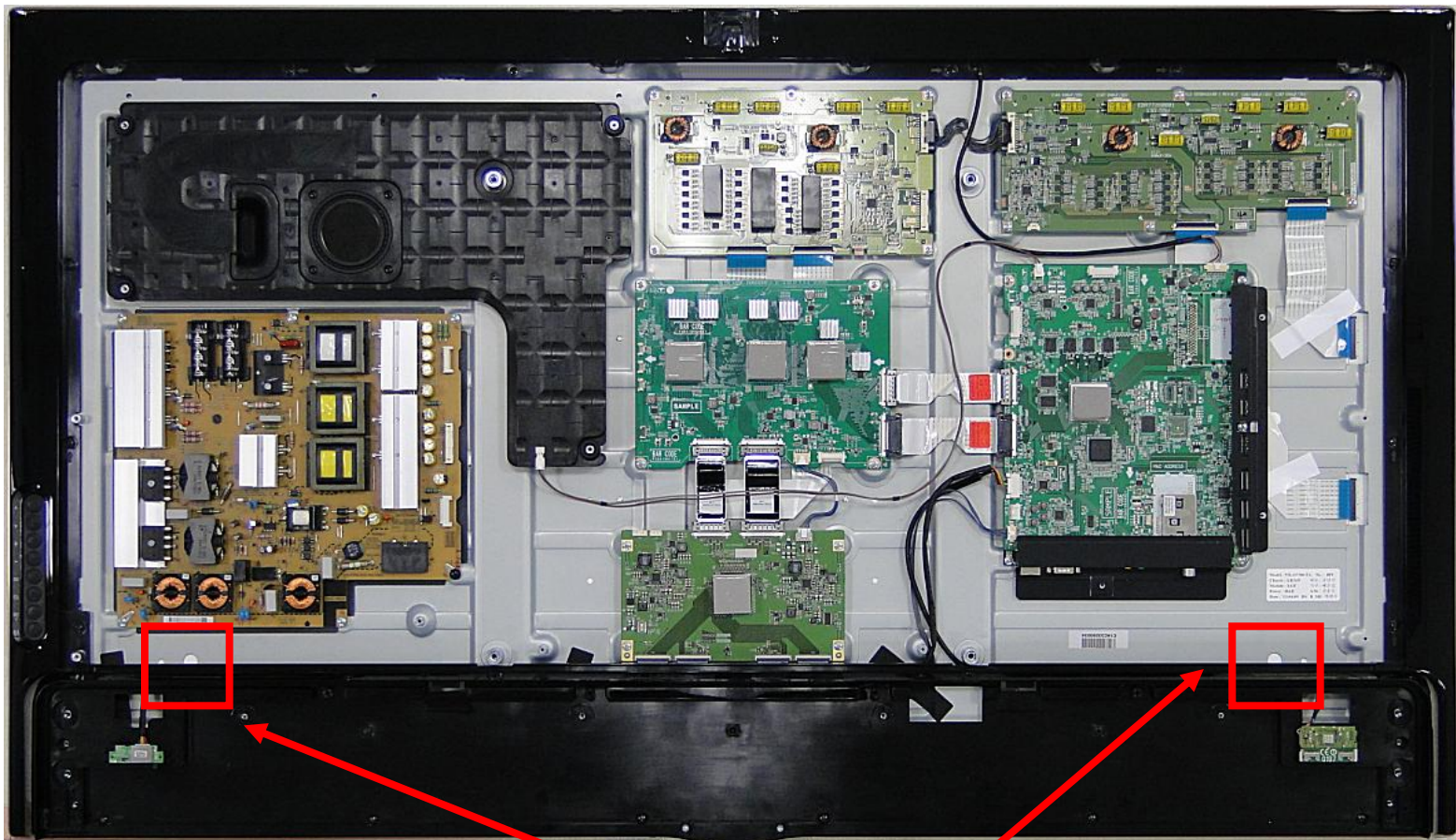
After turning on the power and disassembling the case, check with the naked eye, whether you can see light from 2 locations.

A1-1

# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/Normal audio	Established date	2013.01.31	A1-2
	Content	Check LCD back light with naked eye	Revised date		

<\*\*LA970\*-Z\*>



After turning on the power and disassembling the case, check with the naked eye, whether you can see light from 2 locations.

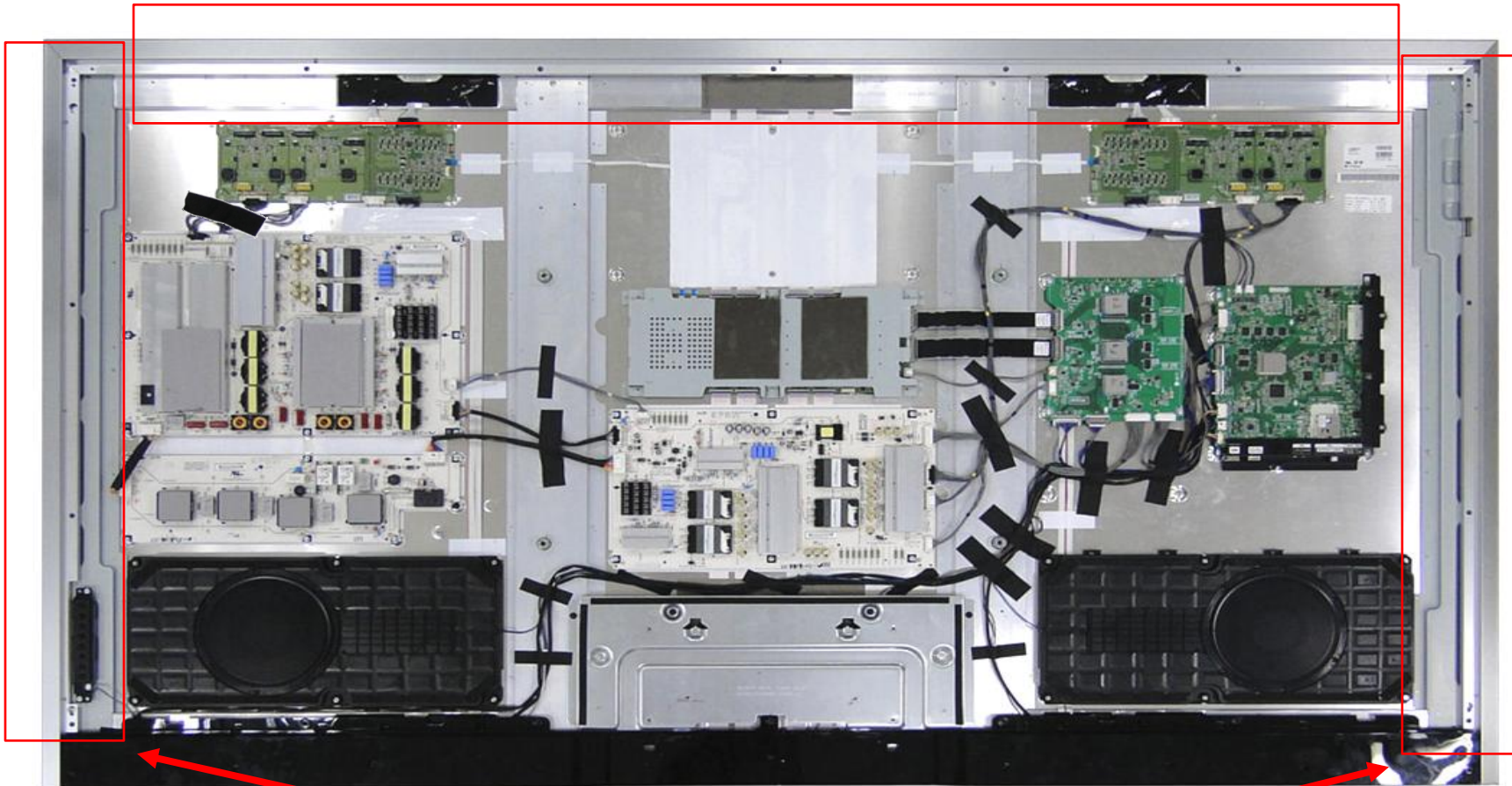
A1-2



# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/Normal audio	Established date	2013.01.31	
	Content	Check LCD back light with naked eye	Revised date		A1-2

<84LM996/LA980V-ZD>



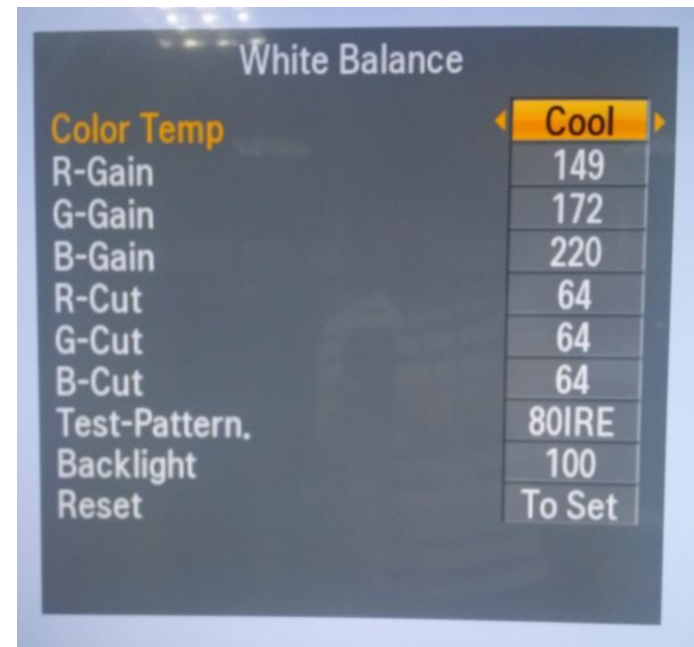
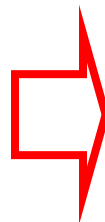
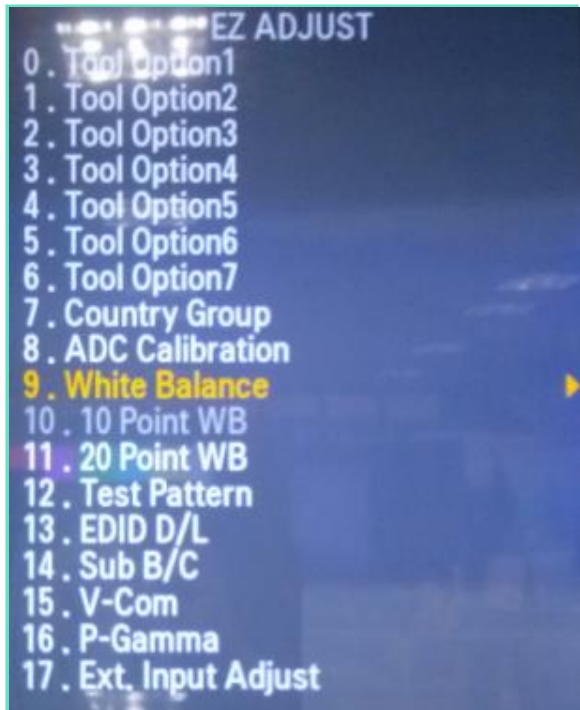
After turning on the power and disassembling the case, check with the naked eye, whether you can see light around module.

A1-2

# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/Normal audio	Established date	2013.01.31	
	Content	Check White Balance value	Revised date		A2

<ALL MODELS>



## Entry method

1. Press the ADJ button on the remote controller for adjustment.
2. Enter into White Balance of item 9.
3. After recording the R, G, B (GAIN, Cut) value of Color Temp (Cool/Medium/Warm), re-enter the value after replacing the MAIN BOARD.

A2

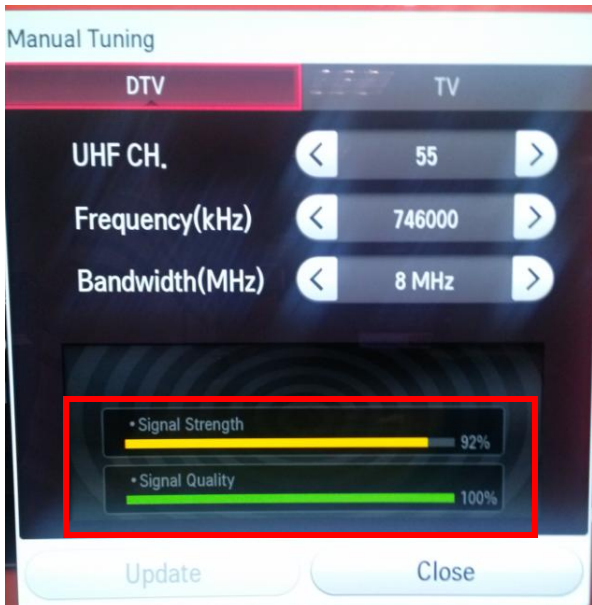
# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date	2013.01.31	
	Content	TUNER input signal strength checking method	Revised date		A3

<ALL MODELS>



Settings → Set up → Manual Tuning  
→ select channel



When the signal is strong, use the attenuator (-10dB, -15dB, -20dB etc.)



A3



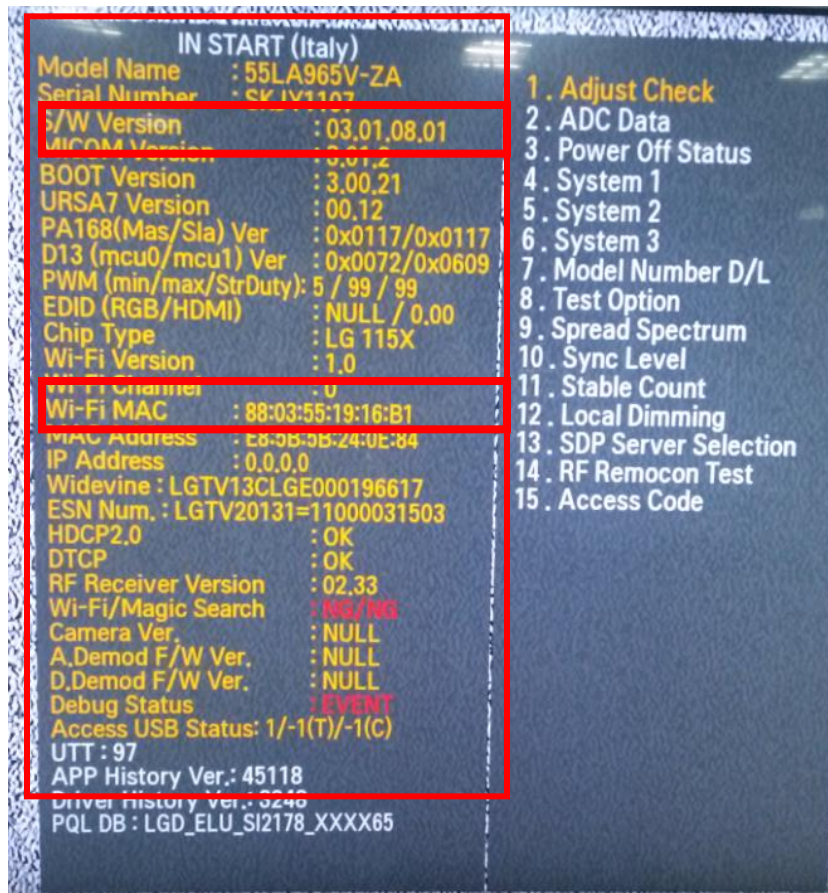
# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date	2013.01.31	
	Content	LCD-TV Version checking method	Revised date		A4

<ALL MODELS>

## 1. Checking method for remote controller for adjustment

Version

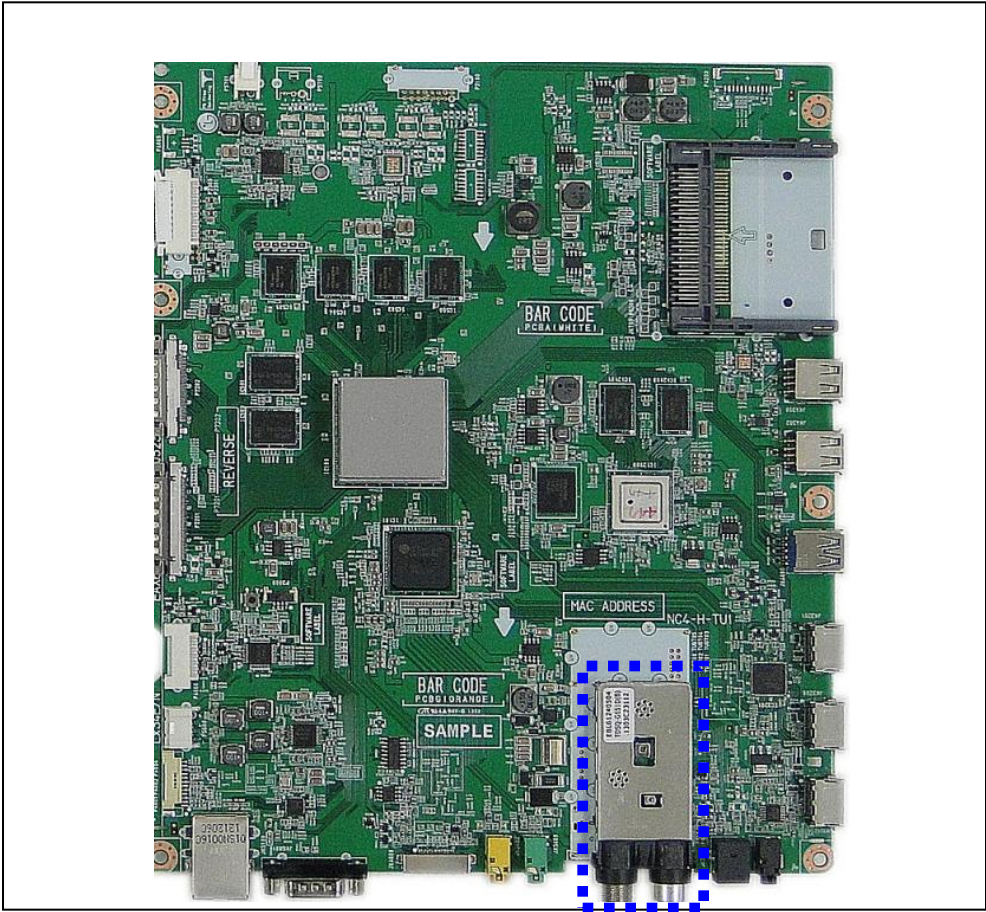


Press the IN-START with the remote controller for adjustment

# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date	2013.01.31	
	Content	TUNER checking part	Revised date		A5

<ALL MODELS>



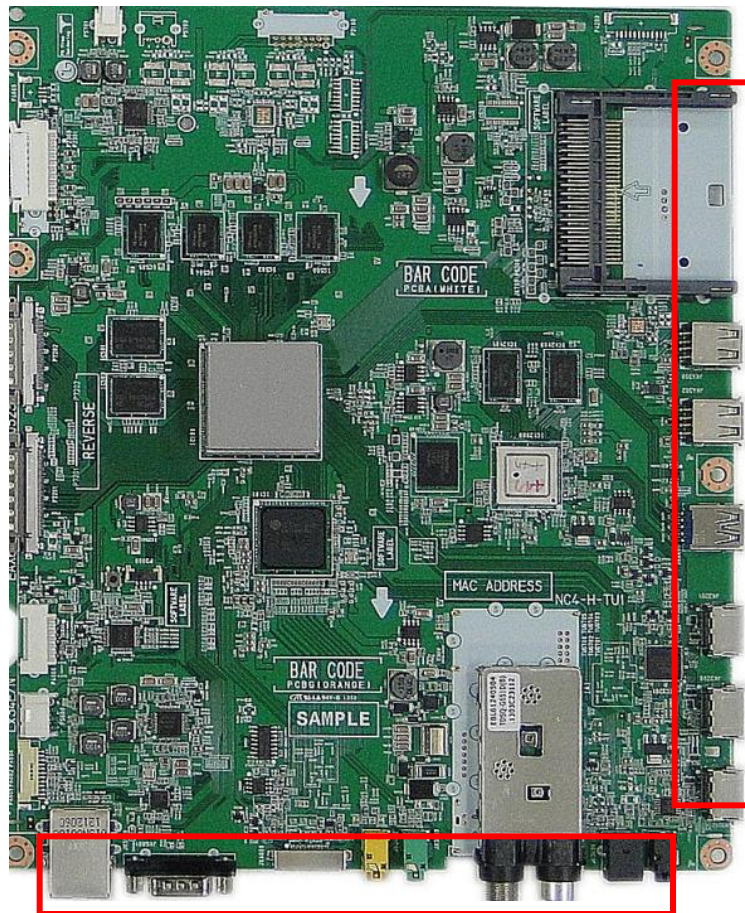
- Checking method:
1. Check the signal strength or check whether the screen is normal when the external device is connected.
  2. After measuring each voltage from power supply, finally replace the MAIN BOARD.



# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error _ Vertical/Horizontal bar, residual image, light spot	Established date	2013.01.31	
	Content	LCD TV connection diagram (1)	Revised date		A6

<ALL MODELS>



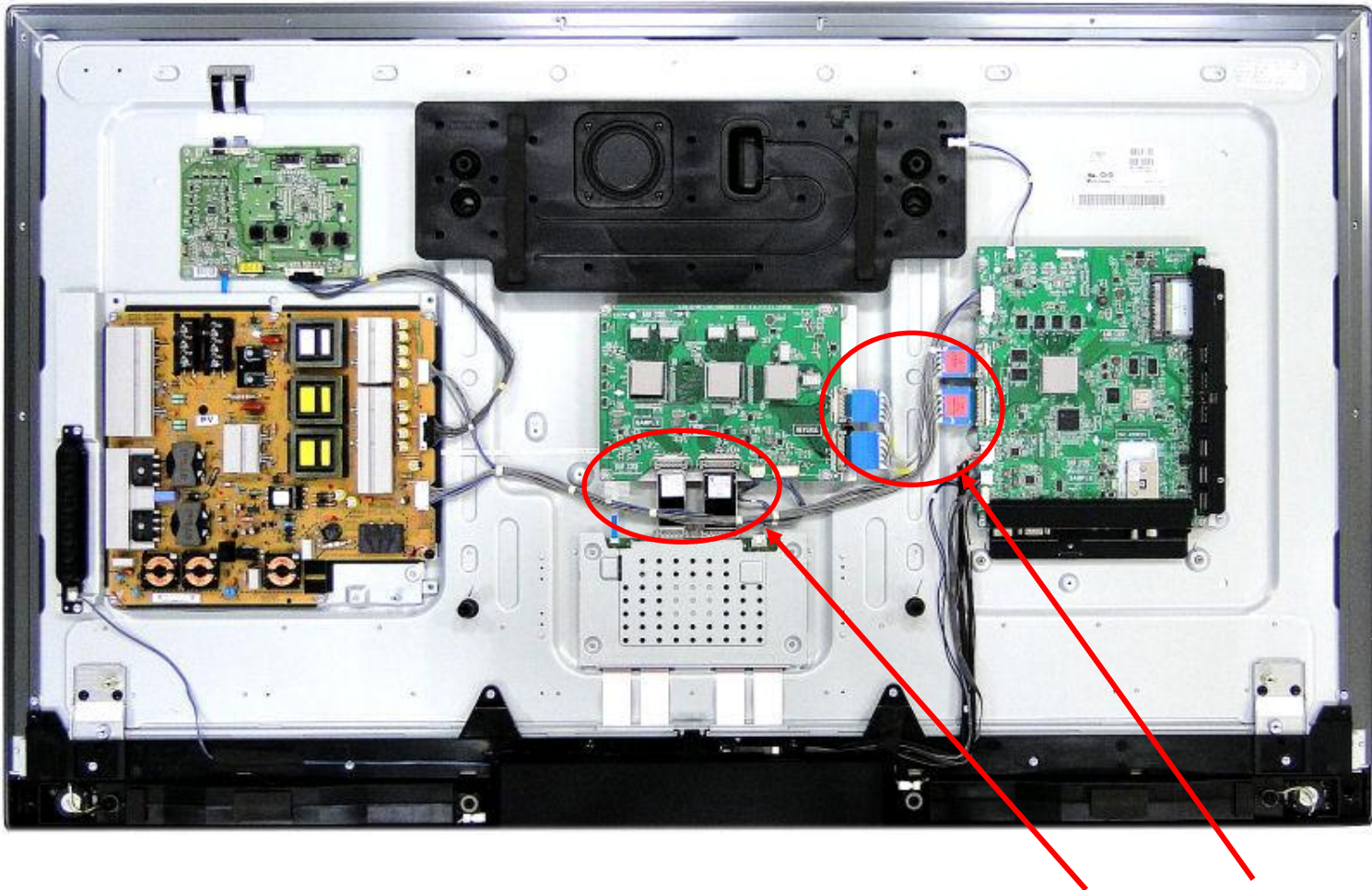
As the part connecting to the external input, check the screen condition by signal

A6

# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Color error	Established date	2013.01.31	
	Content	Check Link Cable (LVDS) reconnection condition	Revised date		A7-1

< \*\*LA965\*-Z\* >



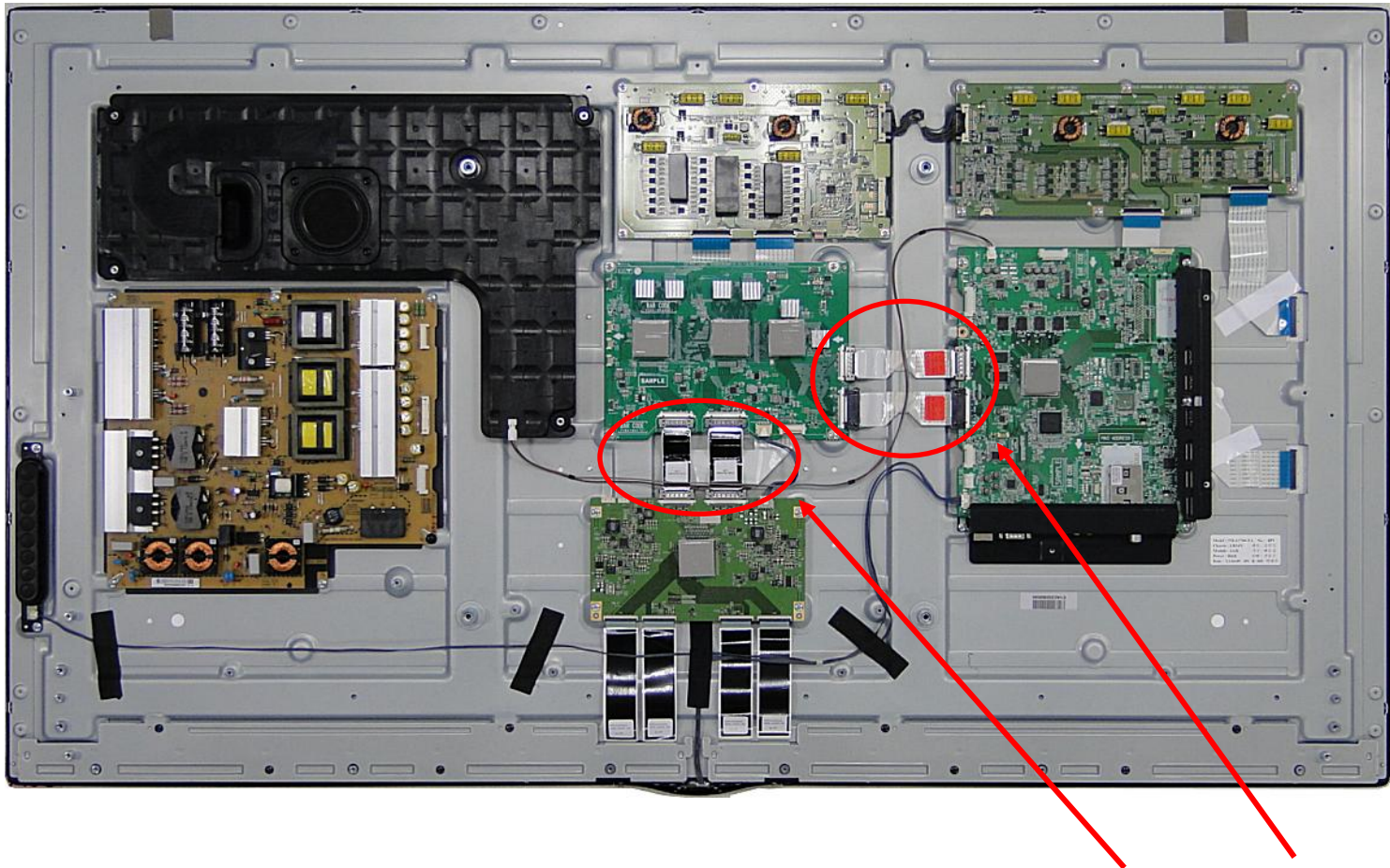
Check the contact condition of the Link Cable, especially dust or mis insertion.



# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Color error	Established date	2013.01.31	
	Content	Check Link Cable (LVDS) reconnection condition	Revised date		A7

< \*\*LA970\*-Z\* >



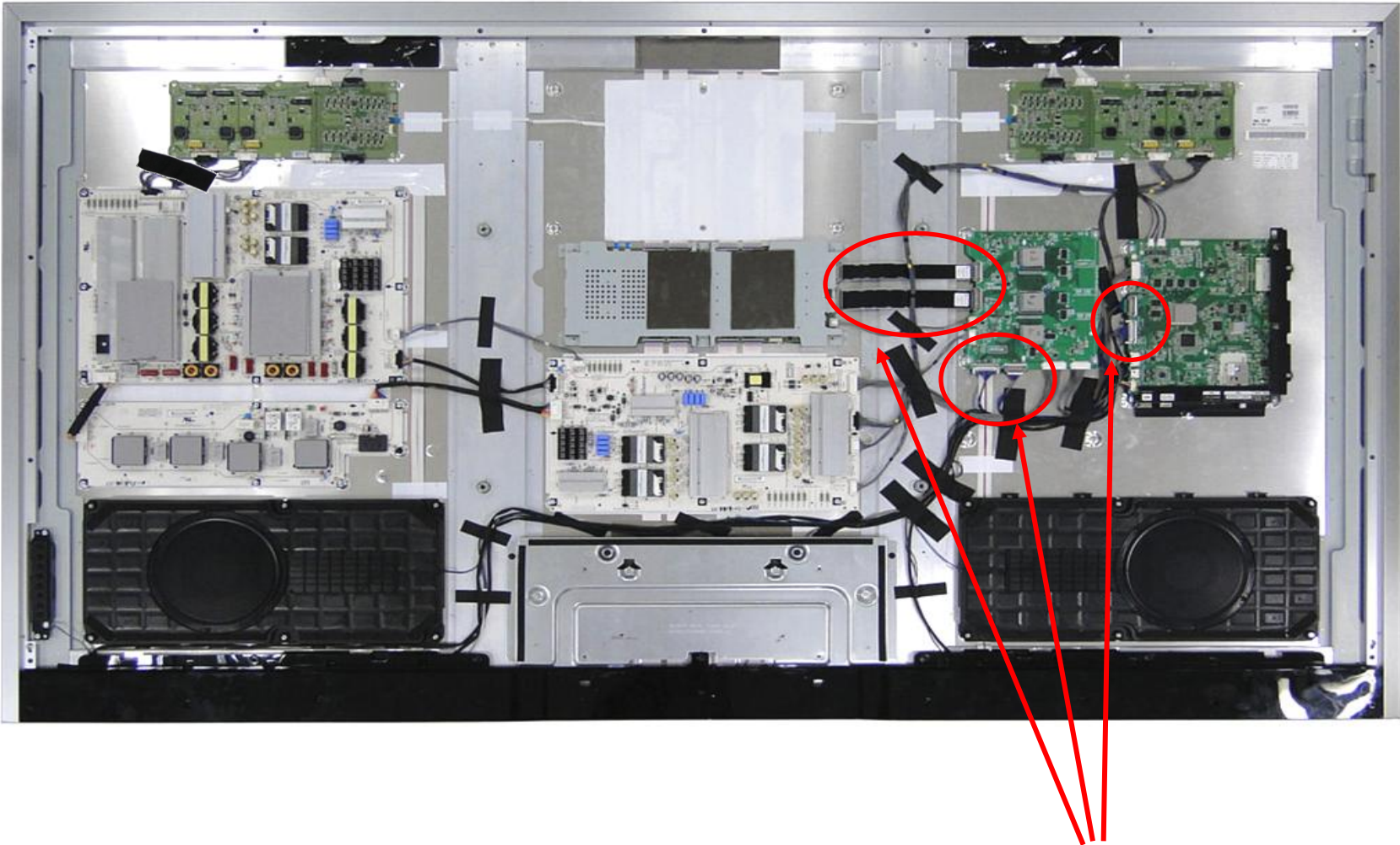
Check the contact condition of the Link Cable, especially dust or mis insertion.

A7

# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Color error	Established date	2013.01.31	
	Content	Check Link Cable (LVDS) reconnection condition	Revised date		A7

<84LM996/LA980V-ZD>



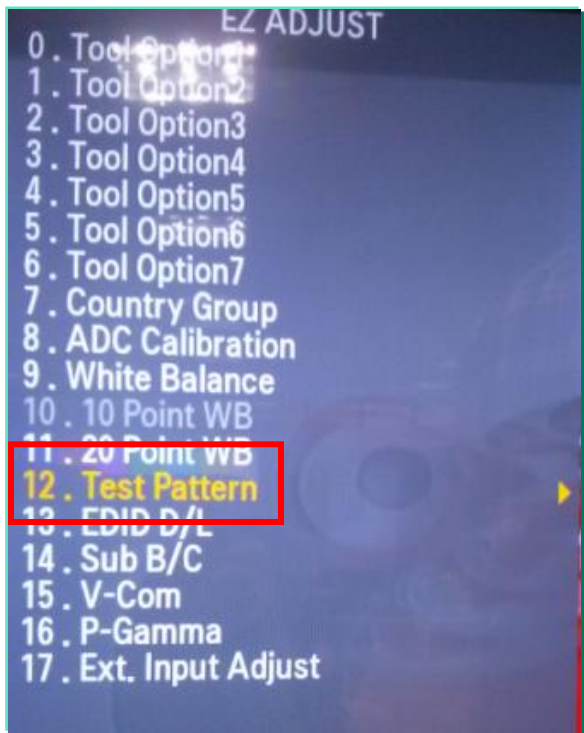
Check the contact condition of the Link Cable, especially dust or mis insertion.

A7



# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Color error	Established date	2013.01.31	
	Content	Adjustment Test pattern - ADJ Key	Revised date		A8



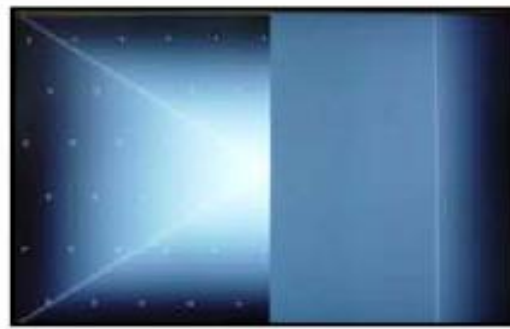
You can view 6 types of patterns using the ADJ Key

Checking item : 1. Defective pixel    2. Residual image    3. MODULE error (ADD-BAR,SCAN BAR..)  
4.Video error (Classification of MODULE or Main-B/D!)

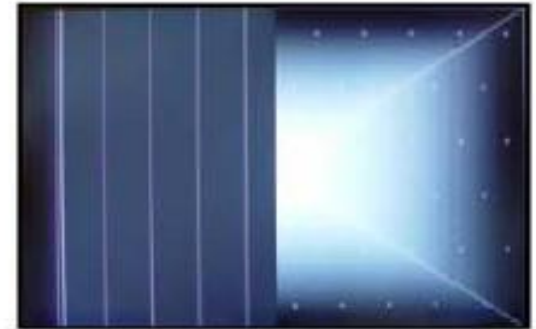
# Appendix : Exchange Main Board (1)



Solder defect, CNT Broken



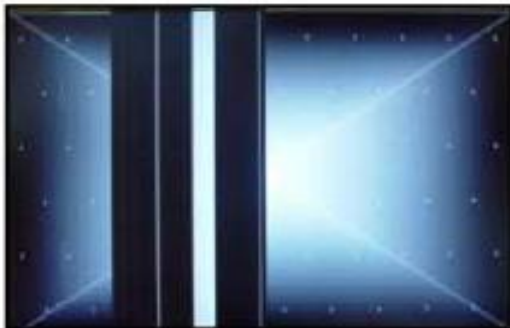
Solder defect, CNT Broken



Solder defect, CNT Broken



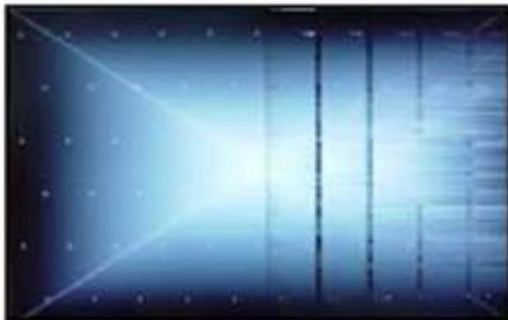
Solder defect, CNT Broken



Solder defect, CNT Broken



Abnormal Power Section



Solder defect, Short/Crack



Abnormal Power Section



Solder defect, Short/Crack



## Appendix : Exchange Main Board (2)



Abnormal Power Section



Abnormal Power Section



Solder defect, Short/Crack



Solder defect, Short/Crack



Fuse Open, Abnormal power section



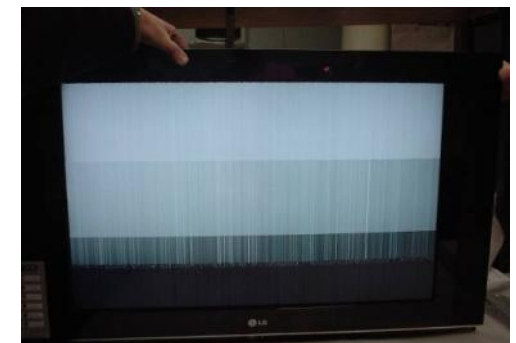
Abnormal Display



GRADATION



Noise



GRADATION

## Appendix : Exchange Power Board (PSU)



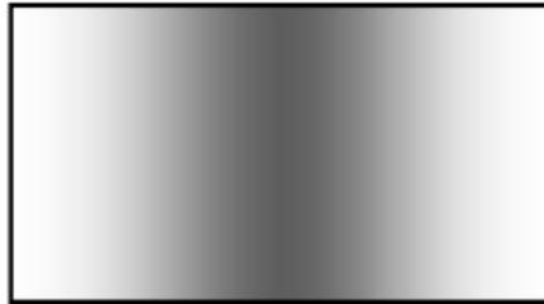
No Light



Dim Light



Dim Light



Dim Light



No picture/Sound Ok

## Appendix : Exchange the Module (1)



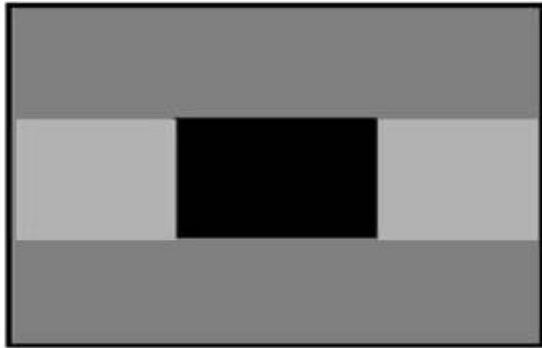
Panel Mura, Light leakage



Panel Mura, Light leakage



Press damage



Crosstalk



Press damage



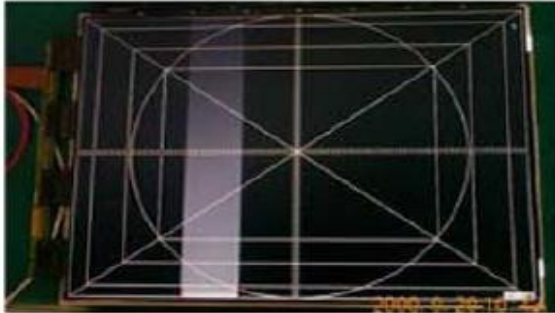
Crosstalk



Press damage

**Un-repairable Cases**  
**In this case please exchange the module.**

## Appendix : Exchange the Module (2)



Vertical Block  
Source TAB IC Defect



Vertical Line  
Source TAB IC Defect



Vertical Block  
Source TAB IC Defect



Horizontal Block  
Gate TAB IC Defect



Horizontal Block  
Gate TAB IC Defect



Horizontal line  
Gate TAB IC Defect



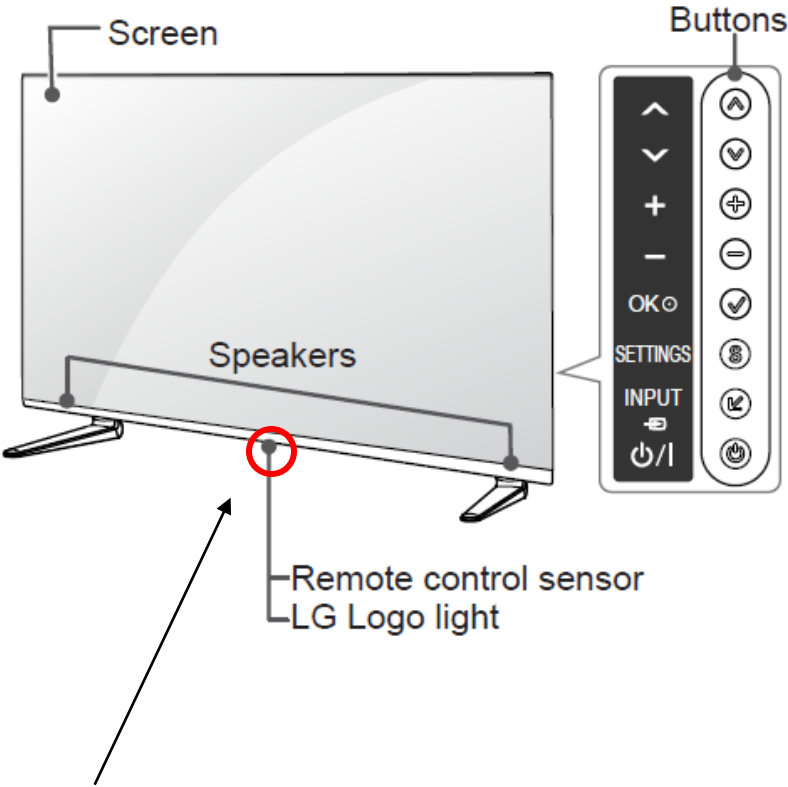
Horizontal Block  
Gate TAB IC Defect

**Un-repairable Cases**  
**In this case please exchange the module.**

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _No power	Established date	2013.01.31	
	Content	Check front Power Indicator	Revised date		A17-1

< \*\*LA965\*-Z\* >



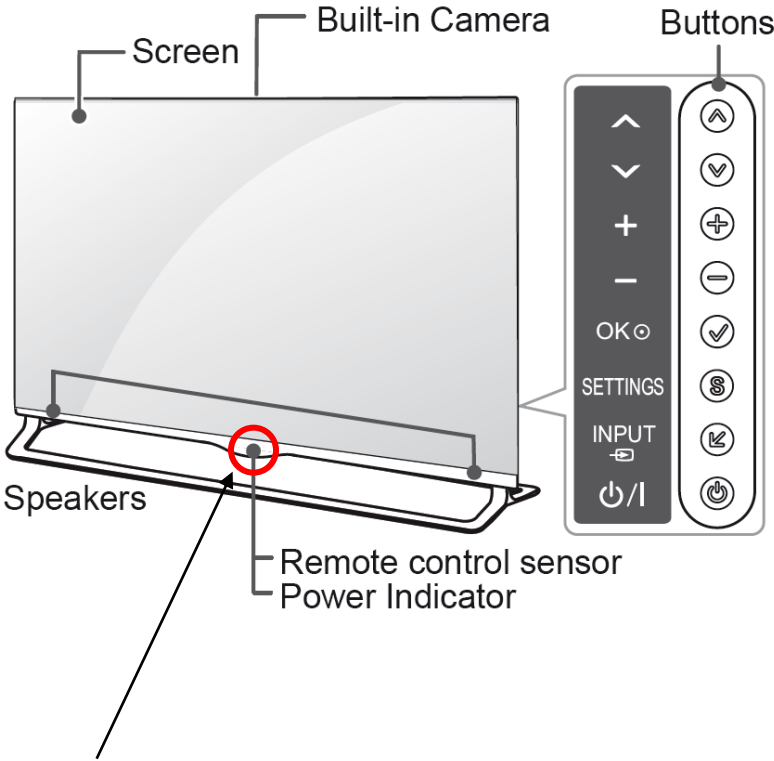
Button	Description
^ v	Scrolls through the saved programmes.
+ -	Adjusts the volume level.
✓	Selects the highlighted menu option or confirms an input.
S	Accesses the main menu, or saves your input and exits the menus.
↶	Changes the input source.
⏻	Turns the power on or off.

ST-BY condition: On or Off  
Power ON condition: Turn Off

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _No power	Established date	2013.01.31	
	Content	Check front Power Indicator	Revised date		A17-2

< \*\*LA970\*-Z\* >



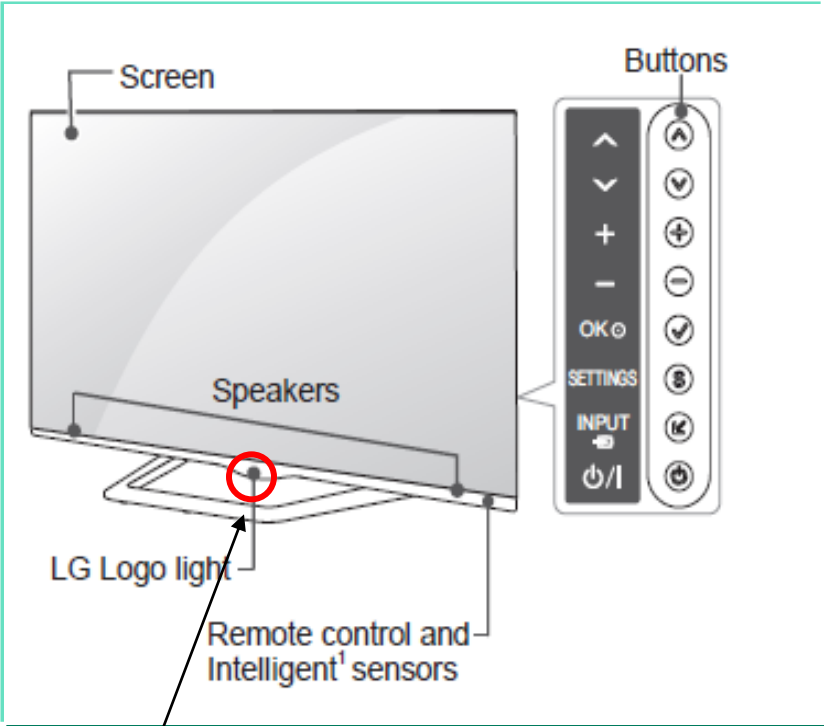
Button	Description
^ v	Scrolls through the saved programmes.
+ -	Adjusts the volume level.
✓	Selects the highlighted menu option or confirms an input.
S	Accesses the main menu, or saves your input and exits the menus.
↶	Changes the input source.
⏻	Turns the power on or off.

ST-BY condition: On or Off  
Power ON condition: Turn Off

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _No power	Established date	2013.01.31	
	Content	Check front Power Indicator	Revised date		A17-2

<84LM996/LA980V-ZD>



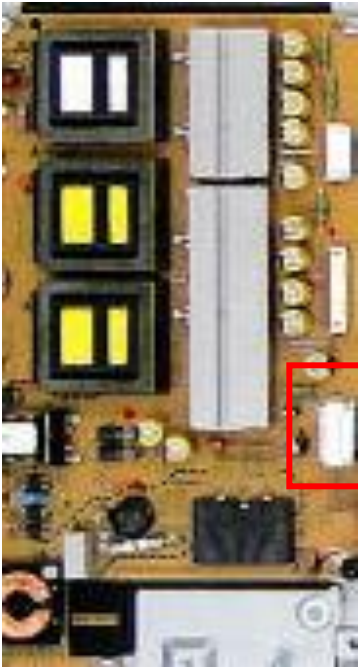
Button	Description
^ v	Scrolls through the saved programmes.
+ -	Adjusts the volume level.
✓	Selects the highlighted menu option or confirms an input.
S	Accesses the main menu, or saves your input and exits the menus.
↵	Changes the input source.
⏻	Turns the power on or off.

ST-BY condition: On or Off  
Power ON condition: Turn Off



Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _No power	Established date	2013.01.31	
	Content	Check power input voltage and ST-BY 3.5V	Revised date		A18



Check the DC 24V, 12V, 3.5V.

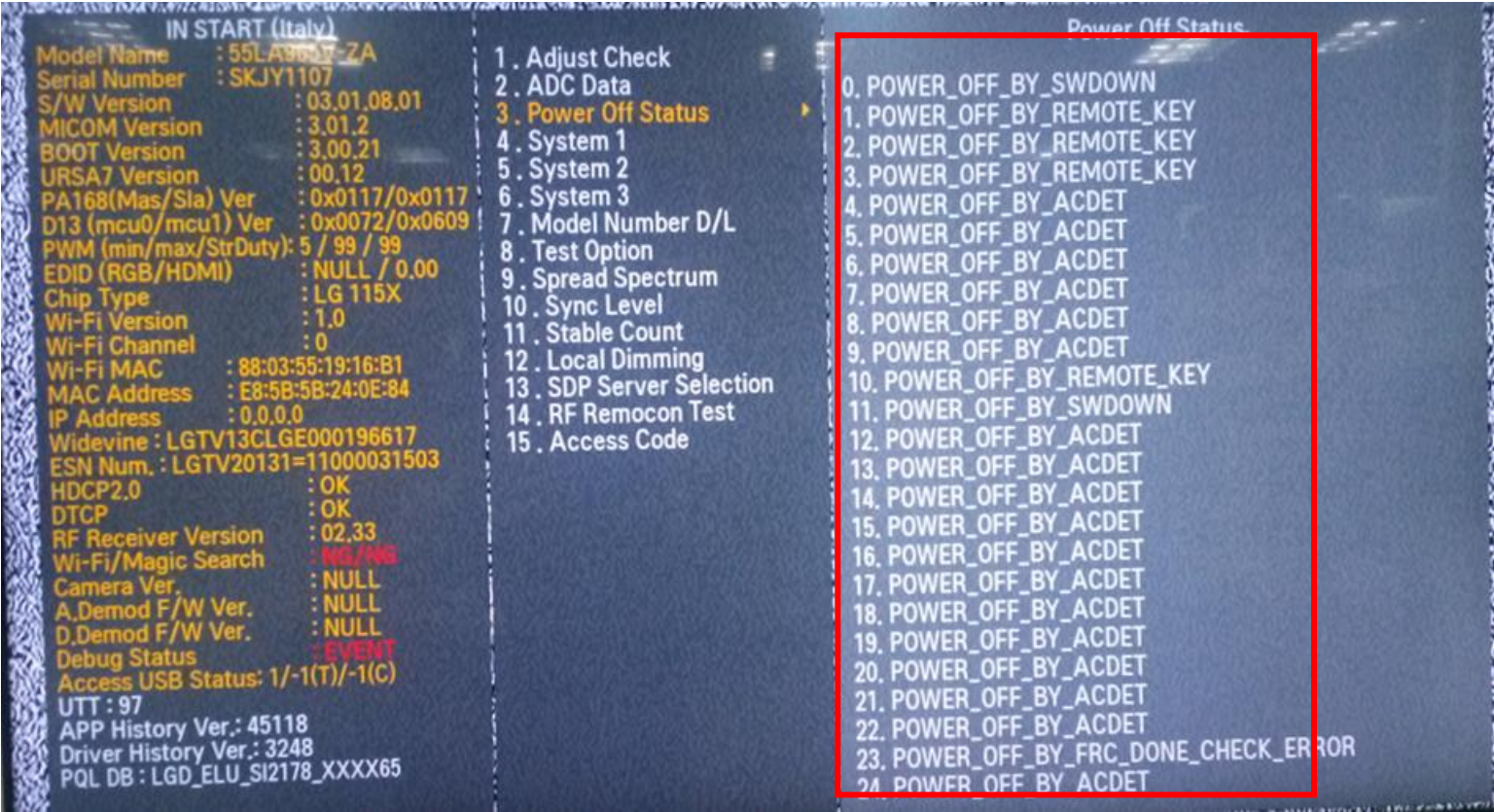
18 Pin (Power Board ↔ Main Board)			
1	Power on	2	INV ON
3	3.5V	4	PDIM#1
5	3.5V	6	PDIM#2
7	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND



# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _Off when on, off whiling viewing	Established date	2013.01.31	
	Content	POWER OFF MODE checking method	Revised date		A19

<ALL MODELS>



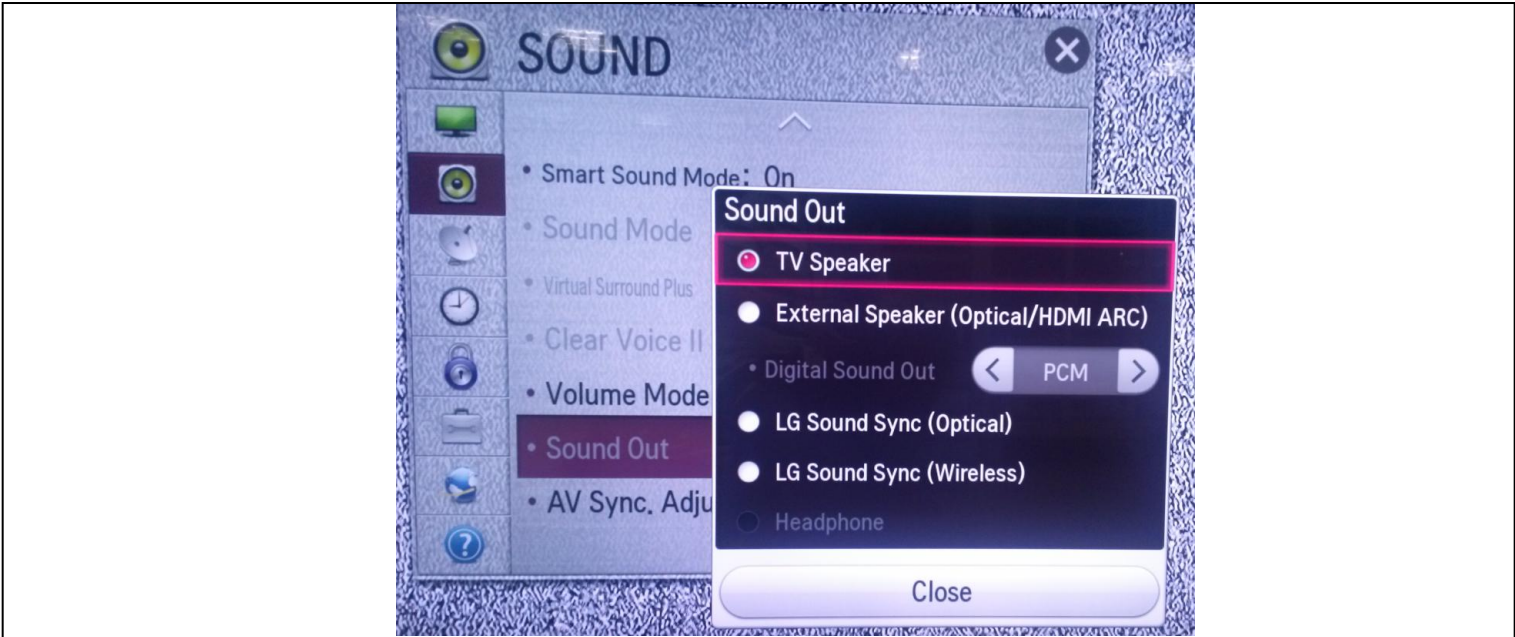
### Entry method

1. Press the IN-START button of the remote controller for adjustment
2. Check the entry into adjustment item 3

# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	C. Audio error_No audio/Normal video	Established date	2013.01.31	
	Content	Checking method in menu when there is no audio	Revised date		A20

<ALL MODELS>



## Checking method

1. Press the Setting button on the remote controller
2. Select the Sound function of the Menu
3. Select the Sound Setting
4. Select TV Speaker

A20



# Standard Repair Process Detail Technical Manual

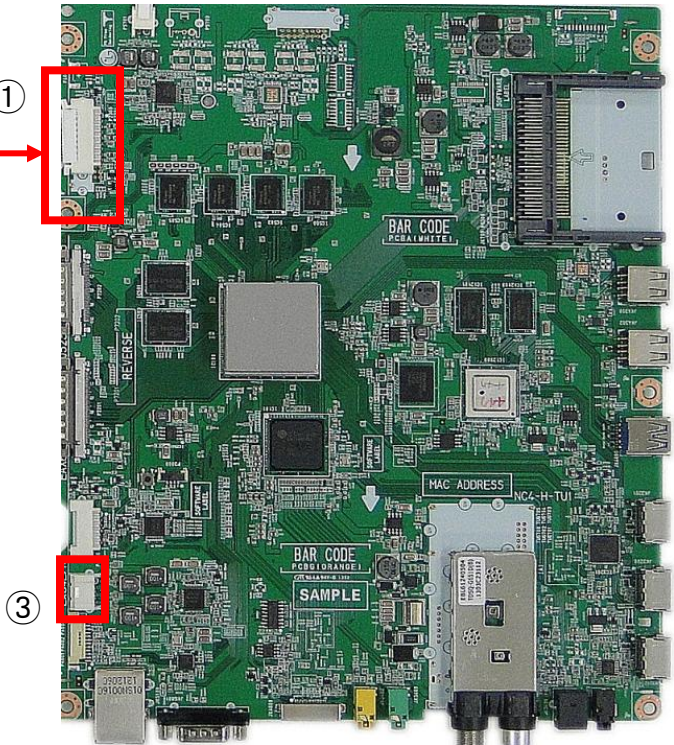
LCD TV	Error symptom	C. Audio error_No audio/Normal video	Established date	2013.01.31	
	Content	Voltage and speaker checking method when there is no audio	Revised date		A21

<ALL MODELS>



24 Pin (Power Board ↔ Main Board)			
1	Power on	2	INV ON
3	3.5V	4	PDIM#1
5	3.5V	6	PDIM#2
7	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND

< All Models>



## Checking order when there is no audio

- ① Check the contact condition of or 24V connector of Main Board
- ② Measure the 24V input voltage supplied from Power Board  
(If there is no input voltage, remove and check the connector)
- ③ Connect the tester RX1 to the speaker terminal and if you hear the Chik Chik sound when you touch the GND and output terminal, the speaker is normal.

# Standard Repair Process Detail Technical Manual

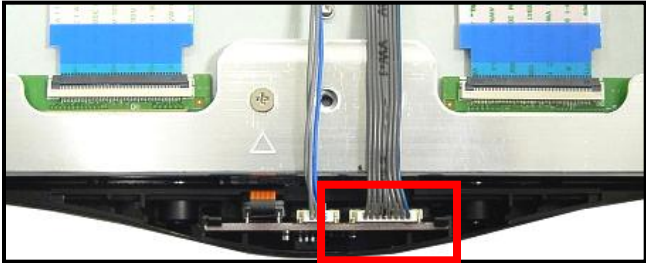
LCD TV	Error symptom	D. Function error	Established date	2013.01.31	
	Content	Remote controller operation checking method	Revised date		A22

< \*\*LA965\*-Z\* >



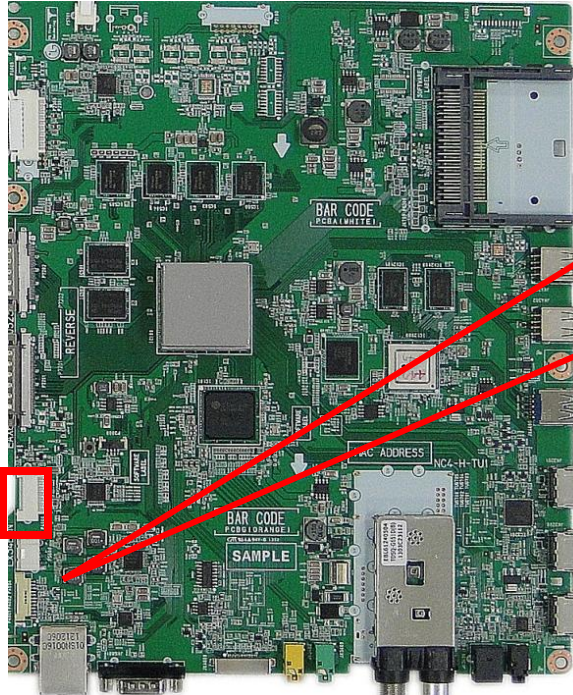
①

< \*\*LA970\*-Z\* >



①

< All Models >



P4002	
1	GND
2	KEY1
3	KEY2
4	+3.5V_ST
5	GND
6	LED
7	+3.5V_ST
8	GND

③

④

## Checking order

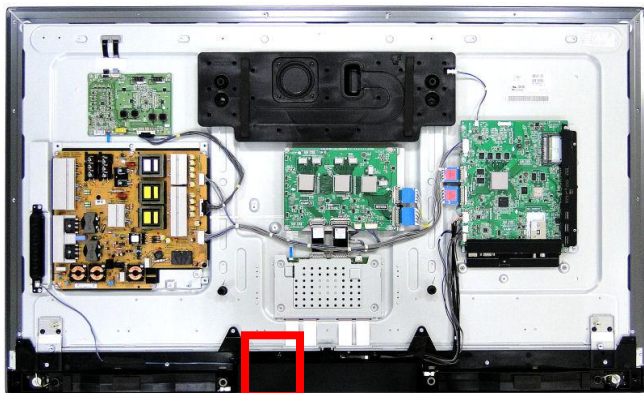
- 1, 2. Check IR cable condition between IR & Main board.
3. Check the st-by 3.5V on the terminal 4,7.
4. When checking the Pre-Amp when the power is in ON condition, it is normal when the Analog Tester needle moves slowly, and defective when it does not move at all.



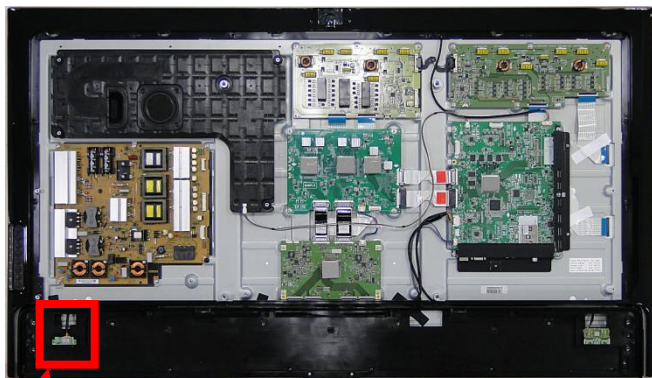
# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	D. Function error	Established date	2013.01.31	
	Content	Motion Remote operation checking method	Revised date		A23

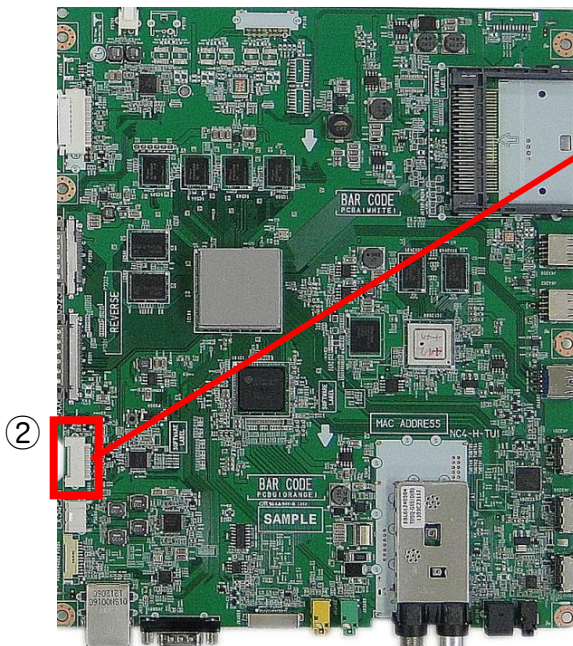
< \*\*LA965\*-Z\* >



< \*\*LA970\*-Z\* >



< All Models >



P4000	
1	+3.5V_WOL
2	+3.3V
3	USB_DM
4	RTS
5	USB_DP
6	RX
7	GND
8	TX
9	WOL
10	RESET
11	GND
12	CTS
13	NC
14	+3.5V_ST(OLED)
15	IR(OLED)
16	GND

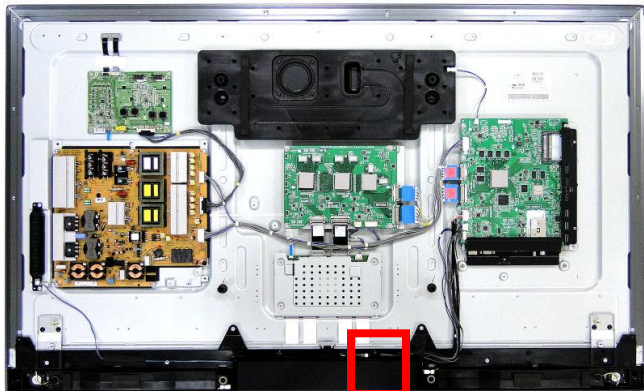
## Checking order

- 1, 2. Check Motion cable condition between Motion assy & Main board.
3. Check the 3.3V on the terminal 2.

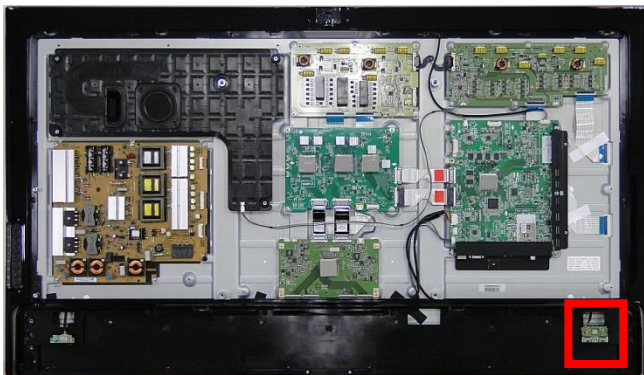
# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	D. Function error	Established date	2013.01.31	
	Content	Wifi operation checking method	Revised date		A24

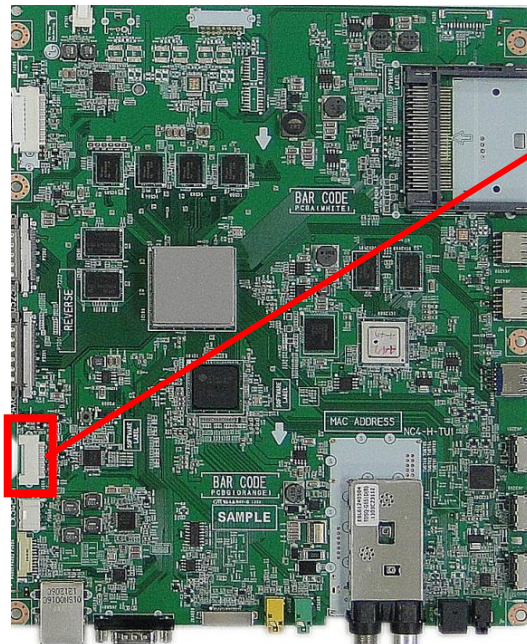
< \*\*LA965\*-Z\* >



< \*\*LA970\*-Z\* >



< All Models >



P4000	
1	+3.5V_WOL
2	+3.3V
3	USB_DM
4	RTS
5	USB_DP
6	RX
7	GND
8	TX
9	WOL
10	RESET
11	GND
12	CTS
13	NC
14	+3.5V_ST(OLED)
15	IR(OLED)
16	GND

## Checking order

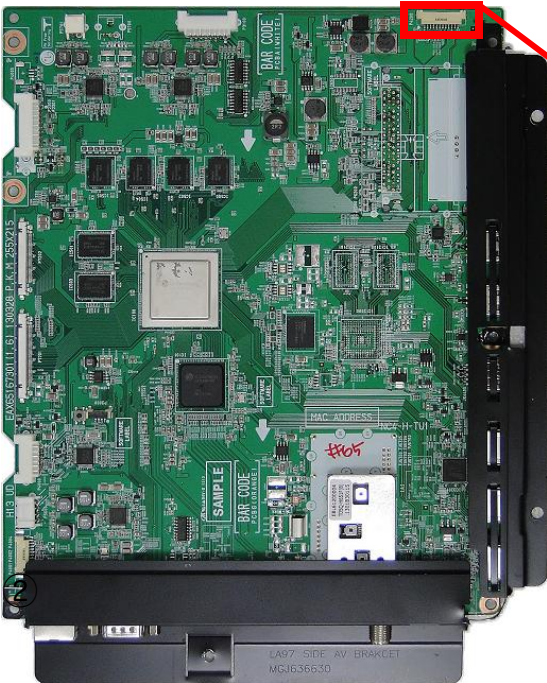
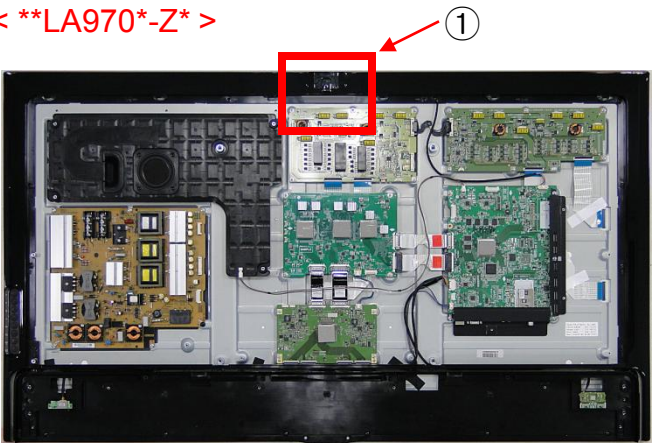
- 1, 2. Check Wifi cable condition between Wifi assy & Main board.
3. Check the 3.3V on the terminal 2.



Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	D. Function error	Established date	2013.01.31	
	Content	Camera operation checking method	Revised date		A25

< \*\*LA970\*-Z\* >



P4000	
1	CAM_SLIDE_DET
2	+3.5V_CAM
3	AUD_LRCH
4	AUD_LRCK
5	AUD_SCK
6	GND
7	CAM_PWR_ON_CMD
8	ST_BY_DET_CAM
9	GND
10	USB_CAMERA_DP
11	USB_CAMERA_DM
12	GND

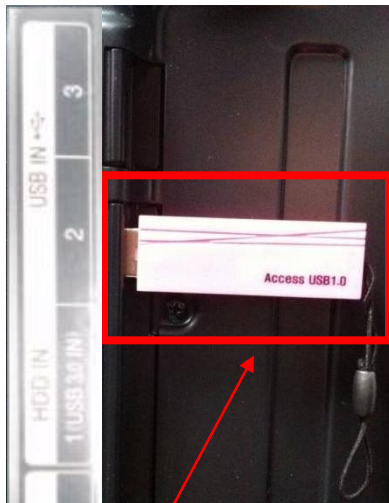
Checking order

- 1, 2. Check Camera cable condition between Camera assy & Main board.
- 3. Check the 3.5V on the terminal 2.

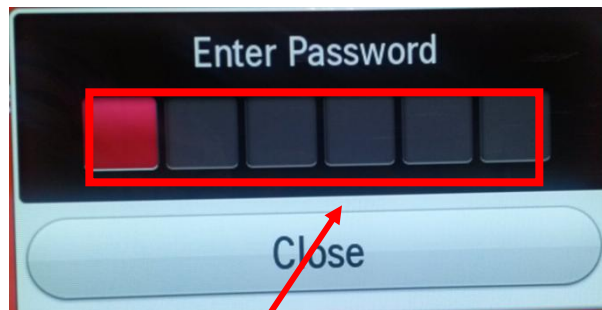
# Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	E. Etc	Established date	2013.01.31	
	Content	Tool option changing method	Revised date		A26

< ALL MODELS >



①



②

## Changing method

1. Contact the USB memory. (USB 1,2,3 jack)
  2. Enter the password. (ex. 000000)
- \* Access USB Memory has each password.

A26